CONSULTANT REPORT

ENERGY AWARE FACILITY SITING AND PERMITTING GUIDE

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Prepared by: Aspen Environmental Group

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ABSTRACT

The *Energy Aware Facility Siting and Permitting Guide* is an update of an earlier guide developed by the Energy Commission in the 1990s. This guide assists local governments with developing general plan energy and transmission elements and provides guidance on electricity generation and transmission planning and permitting. California has ambitious greenhouse gas emission reduction targets and renewable energy development targets that are spurring new energy infrastructure. The guide describes the regulations and policies (both federal and state); planning processes that define future electricity generation and transmission needs; development and permitting of renewable energy facilities in more remote locations of the state; and the transmission lines needed to access these facilities. Throughout the guide, opportunities for local government involvement in electricity infrastructure planning and permitting are presented. Examples of local government development of energy planning tools and involvement in generation and transmission planning and permitting are provided. The *Energy Aware Facility Siting and Permitting Guide* also describes the environmental impacts associated with developing new generation and transmission lines.

Keywords: Electricity generation, transmission lines, renewables, local government, energy elements, transmission elements, energy planning and permitting, lead agency, environmental impacts, CEQA, NEPA, transmission corridor

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EXECUTIVE SUMMARY

Introduction

The *Energy Aware Facility Siting and Permitting Guide* is a comprehensive resource for local governments seeking to be more engaged in how electricity infrastructure is developed within their own communities and within the state at large. As California responds to climate change science and regulation, new methods of generating electricity are being proposed and built. Electricity infrastructure is being considered in locations where no infrastructure previously existed and can vary in size from quite small to extremely large. This guide provides essential information to local and regional governments describing the regulatory framework, permitting processes, and environmental impacts associated with electricity infrastructure.

Purpose

This guide is intended to help local governments plan for and permit electricity generation facilities and transmission lines that will be needed in the upcoming years. It provides a framework to inform planners, decision makers, and the public about what, how, and why electricity infrastructure may be developed.

Chapter 1 introduces the guide, identifies its purpose, briefly describes how electricity is generated and transmitted, identifies the key players in future electricity infrastructure planning and development, and illustrates the location of current electricity infrastructure.

Chapter 2 identifies the general processes for defining future generation and transmission needs and for permitting of subsequent generation and transmission infrastructure.

Chapter 3 identifies the major laws and policies that shape what kind of generation and transmission is proposed and permitted.

Chapter 4 identifies the kinds of generation and transmission projects that are likely to occur within the next 20 years.

Chapter 5 discusses the environmental review process and permitting responsibilities of the various parties who must certify or approve electricity infrastructure.

Chapter 6 discusses the increasing role of local governments as the state expands its energy goals. It also contains information and recommendations for local energy infrastructure planning and the legal authority for local government involvement in the planning process.

Chapter 7 considers the environmental impacts of new energy facilities.

GLOSSARY OF ACRONYMS

TERM	ACRONYM
California Assembly Bill	AB
Application for Certification	AFC
Administrative Law Judge	ALJ
Advanced metering infrastructure	AMI
Air Pollution Control District	APCD
California Air Resources Board	ARB
American Recovery and Reinvestment Act of 2009	ARRA
Annual Transmission Plan	ATP
Biological Assessment	BA
Best Available Control Technologies	BACT
Bureau of Land Management	BLM
Best management practice	BMP
Central California Clean Energy Transmission Project	C3ETP
California Independent System Operator	California ISO
Carbon capture and storage	CCS
California Desert Conservation Act	CDCA
California Department of Fish and Game	CDFG
California Energy Commission	CEC
California Environmental Quality Act	CEQA
Code of Federal Regulations	CFR
Methane	CH_4
Carbon monoxide	CO
Carbon dioxide	CO_2
Council of Governments	COG
Certification of Public Convenience and Necessity	CPCN
California Public Utilities Commission	CPUC
Competitive Renewable Energy Zone	CREZ
California Register of Historical Resources	CRHR
Cultural Resources Specialist	CRS
California Transmission Planning Group	CTPG
Conditional use permit	CUP
Data adequacy	DA
Decibel	dB
A-weighted sound level	dBA
Draft environmental impact statement	DEIS
Determination of Compliance	DOC
United States Department of Energy	DOE
California Division of Conservation Division of Oil, Gas, and Geothermal Resources	DOGGR
United States Department of Interior	DOI
Desert Renewable Energy Conservation Plan	DRECP
Data request	DReq

TERM	ACRONYM
Data response	DResp
Demand-side management	DSM
Environment and lands	E & L
Environmental Assessment	EA
Energy Action Plan II	*EAP II*
Environmental impact report	EIR
Environmental impact statement	EIS
Environmental justice	EJ
Electromagnetic field	EMF
Energy Policy Act of 2005	EPAct-05
Environmental Working Group	EWG
Federal Aviation Administration	FAA
Final environmental impact statement	FEIS
Federal Energy Regulatory Commission	FERC
Final staff assessment	FSA
Government Code	GC
Greenhouse gas	GHG
Geographic Information Systems	GIS
General Order	GO
Go Solar California	GSC
Hydrogen sulfide	H_2S
Habitat conservation plan	HCP
Home Energy Rating System	HERS
Hydrofluorocarbon	HFC
Mercury	Hg
Integrated Energy Policy Report	IEPR
Imperial Irrigation District	IID
Investor-owned utility	IOU
Independent power producer	IPP
Independent System Operator	ISO
Known Geothermal Resource Area	KGRA
Kilowatt	kW
Los Angeles Department of Water and Power	LADWP
Lowest Achievable Emissions Rate	LAER
Lake Elsinore Advanced Pumped Storage	LEAPS
Laws, ordinances, regulations, and standards	LORS
Long Term Procurement Plan	LTPP
Maximum Achievable Control Technologies	MACT
Master environmental assessment	MEA
Master environmental impact report	MEIR
Mitigated negative declaration	MND
Megawatt	MW
Nitrous oxide	N_2O

TERM	ACRONYM
Negative declaration	ND
National Environmental Policy Act	NEPA
Notice of availability	NOA
Notice of completion	NOC
Notice of determination	NOD
Nitrogen oxide	NO_X
National Pollutant Discharge Elimination System	NPDES
Nuclear Regulatory Commission	NRC
National Register of Historic Places	NRHP
New Source Review	NSR
Governor's Office of Planning and Research	OPR
Once-through cooling	OTC
Planning Alternative Corridors for Transmission Lines	PACT
Lead	Pb
Proposed Decision	PD
Proponent's environmental assessment	PEA
Program level environmental impact report	PEIR
Programmatic environmental impact statement	PEIS
Perfluorocarbons	PFC
Pacific Gas and Electric Company	PG&E
Prehearing conference	PHC
Public Interest Energy Research	PIER
Planning for Community Energy, Environmental, and Economic Stability	$PLACE^3S$
Particulate matter	PM
Project manager	PM
Particulate matter less than 10 microns in diameter	PM_{10}
Particulate matter less than 2.5 microns in diameter	$PM_{2.5}$
Presiding Member's Proposed Decision	PMPD
BLM Plan of Development	POD
Publicly owned utility	POU
Power Purchase Agreement	PPA
Permit to construct	PTC
Regional comprehensive plan	RCP
Renewable Energy Action Team	REAT
Renewable Electricity Standard	RES
Regional Energy Strategy	RES
Renewable Energy Transmission Initiative	RETI
Request for offer	RFO
Record of decision	ROD
Right-of-way	ROW
Renewables Portfolio Standard	RPS
Regional Transportation Plan	RTP
Regional Water Quality Control Board	RWQCB

TERM	ACRONYM
Staff assessment	SA
Staff assessment errata	SAE
San Diego Association of Governments	SANDAG
Superfund Amendments and Reauthorization Act 1986	SARA
Senate Bill	SB
South Coast Air Quality Management District	SCAQMD
Southern California Edison	SCE
San Diego Gas & Electric	SDG&E
Sulfur hexafluoride	SF_6
State Historical Preservation Office	SHPO
Sacramento Municipal Utility District	SMUD
Solar Energy Development Programmatic Environmental Impact Statement	Solar PEIS
San Onofre Nuclear Generating Station	SONGS
Sulfur oxide	SO_X
Stakeholder Steering Committee	SSC
Strategic Transmission Investment Plan	STIP
State Water Resources Control Board	SWRCB
Technical Advisory Committee	TAC
Best Available Control Technologies for Toxics	TBACT
U.S. Army Corps of Engineers	USACE
United States Code	USC
United States Fish and Wildlife Service	USFWS
Volatile organic compound	VOC
Western Area Power Administration	WAPA
Western Electricity Coordinating Council	WECC
West Mojave Plan	WEMO
Western Governors' Association	WGA
Western Renewable Energy Zone	WREZ
Zone Identification and Technical Analysis	ZITA

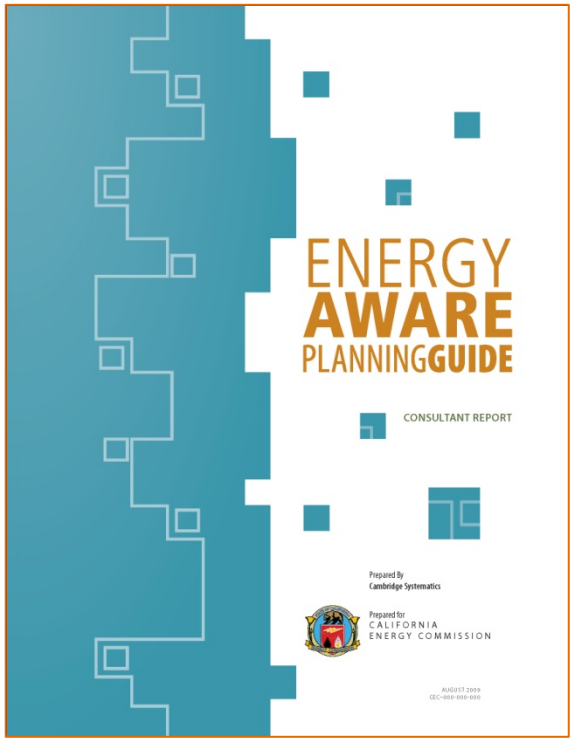
Chapter 1: Introduction

The *Energy Aware Facility Siting and Permitting Guide* is a comprehensive resource for local governments seeking to be more engaged in how electricity infrastructure is developed within their own communities and within the state at large. As California responds to climate change science and regulation, new methods of generating electricity are being proposed and built. Infrastructure is being considered in locations where no infrastructure previously existed and can vary in size from quite small to extremely large. Now more than ever, electricity planning needs an informed public and proactive local government to advise policy and decision makers on the state's electricity future.

Purpose

This guide is intended to help local governments plan for and permit electricity generation facilities and transmission lines that will be needed in the upcoming years. It provides a framework to inform planners, decision makers and the public about what, how, and why electricity infrastructure may be developed.

The *Energy Aware Facility Siting and Permitting Guide* is a companion guide to the *Energy Aware Planning Guide* which provides technical information to local governments seeking to improve energy efficiency, reduce energy use and greenhouse gas emissions, and enhance renewable sources of energy. The two in tandem provide a comprehensive array of tools and strategies for local, regional, and



statewide energy planning. Both guides were first issued in the 1990s, and their current updates reflect many changes that have occurred since then. The nature of electricity infrastructure development in California is changing dramatically; the following factors will affect the ability of local officials to respond effectively to proposed developments.

Concern over climate change requires reduction in greenhouse gas (GHG) emissions. Approximately 25 percent of California's carbon dioxide emissions are from electric utilities, with 12 percent from in-state electricity and 13 percent from imported electricity. The electricity sector will continue to be a major source of GHG emissions in the near future. California has a goal to reduce GHG emissions to 1990 levels by 2020. By 2050, California's GHG emissions are to be 80 percent lower than 1990 levels.

California law established the California Renewables Portfolio Standards (RPS) in 2002 under Senate Bill (SB) 1078 (Sher, Chapter 516, Statutes of 2002), and accelerated the standards in 2006 under SB 107 (Simitian, Chapter 464, Statutes of 2006), requiring more renewable energy development. The State has determined that 20 percent of electricity retail sales should be provided by renewable energy facilities by 2010 and 33 percent by 2020. These are ambitious targets. Much of this electricity may be provided by large-scale facilities.

New transmission lines are needed to access renewable energy facilities in areas remote from urban areas, such as solar power plants in California deserts. The Renewable Energy Transmission Initiative (RETI) stakeholder process has identified the most likely locations for new transmission in the state. Designating corridors in anticipation of future transmission is an important first step.

The recent economic downturn has prompted federal stimulus money to expedite electricity infrastructure development. More projects will need review and permitting by state and federal agencies and local governments.

The ever-increasing use of the internet allows citizens to engage in decision making at every level.

Local governments continue to face budget constraints which hamper the ability to plan for and permit electricity infrastructure.

Information Presented in This Guide

The guide identifies opportunities for local governmental involvement and provides information to help local and Tribal governments engage more effectively in the planning and regulatory process. The guide is organized into the following sections:

Chapter 1 introduces the Guide, identifies its purpose, briefly describes how electricity is generated and transmitted, identifies the key players in future electricity infrastructure planning and development, and illustrates the location of current electricity infrastructure.

Chapter 2 identifies the general processes for defining future generation and transmission needs and for permitting of subsequent generation and transmission infrastructure.

Chapter 3 identifies the major laws and policies that shape what kind of generation and transmission is proposed and permitted.

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infrastructure planning and the legal authority for local government involvement in the planning process.

Chapter 7 considers the environmental impacts of new energy facilities.

Setting the Stage

Electricity Use

Electricity is an essential commodity for everyday life, but many people have incomplete ideas regarding how electricity is generated and distributed. They simply rely on it to light their homes and offices, operate all their electrical appliances, manufacture goods, pump water, and a myriad of other health and safety purposes. In the future, people may use electricity to run their cars. Because currently electricity cannot be easily and inexpensively stored (although new storage possibilities are now under development), a complex system has developed over time to ensure that just enough electricity is produced to meet the demand at a given moment.

California leads the nation in keeping electricity use as low as possible. As shown in Figure 1.1, California's per capita electricity use has remained level over the last 20 years despite the fact that the state's population has grown significantly over that time. However, the state's total electricity use has grown to serve the expanded population.

California has identified preferred sources to meet the demand for electricity. This is referred to as the state's loading order, which gives preference to demand reduction, energy efficiency, distributed energy generation, and renewable energy, followed by clean fossil-fueled generation.

Demand reduction provides economic incentives to large customers to voluntarily lower their energy use to reduce the amount of electricity needed during peak periods like hot summer afternoons when air conditioners are running.

Energy efficiency means using less energy/electricity to perform the same functions. Energy efficiency is a major driver in keeping electricity demand in check. New energy efficiency programs will continue to be valuable, reducing demand in the future.

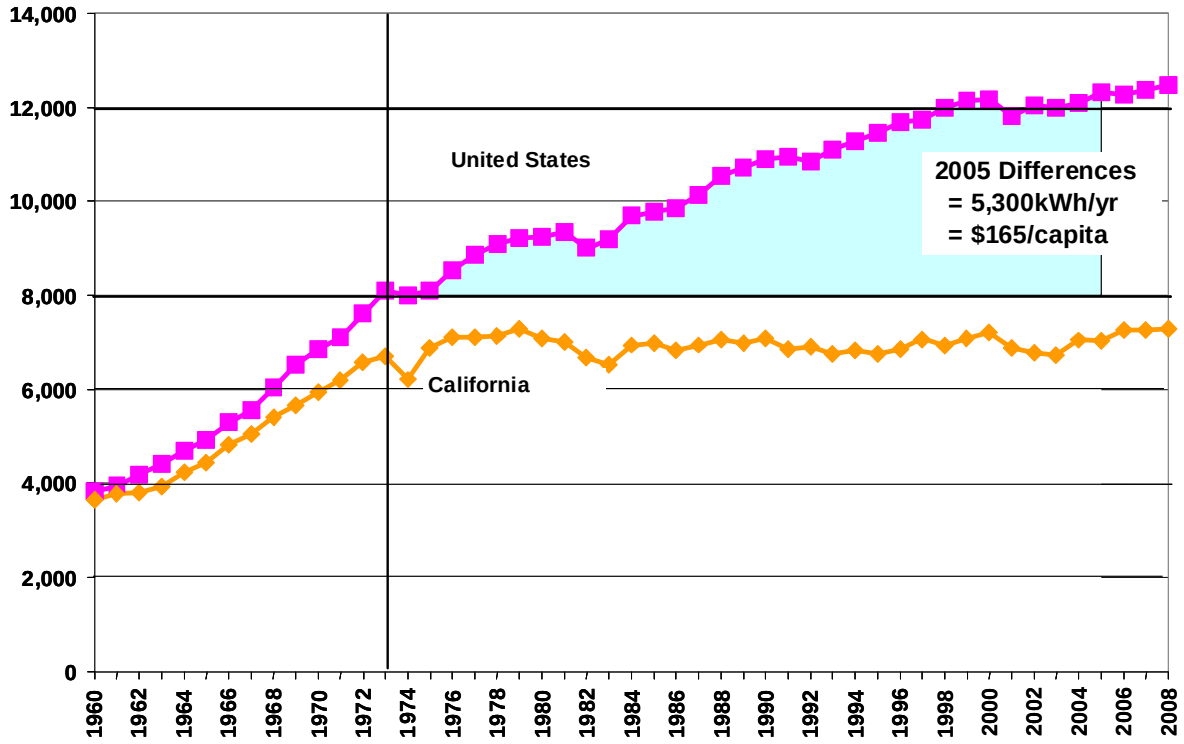
Distributed energy generation uses small-scale power generation technologies (typically in the range of 3 kilowatts to 10 kilowatts—a kW is a unit of measure of the amount of electricity needed to operate given equipment) to provide an alternative to or an enhancement of the traditional electric power system.

Renewable generation includes power plants that use the sun, wind, geothermal (i.e., hot underground water or steam), waves, rivers, and vegetation or animal waste as fuel sources.

Clean fossil fuel includes efficient natural gas power plants. Power plants that use heat to generate electricity are considered thermal power plants; examples include natural gas plants, gas-fired combined heat and power (formerly called cogeneration) facilities, nuclear plants, biomass plants, and some solar facilities.

Figure 1.1: Per Capita Electricity Consumption in the United States and California

(Annual use of electricity in kWh per person from 1960 to 2005 with forecasts through 2008 in California and the U.S.)



Source: California Energy Commission

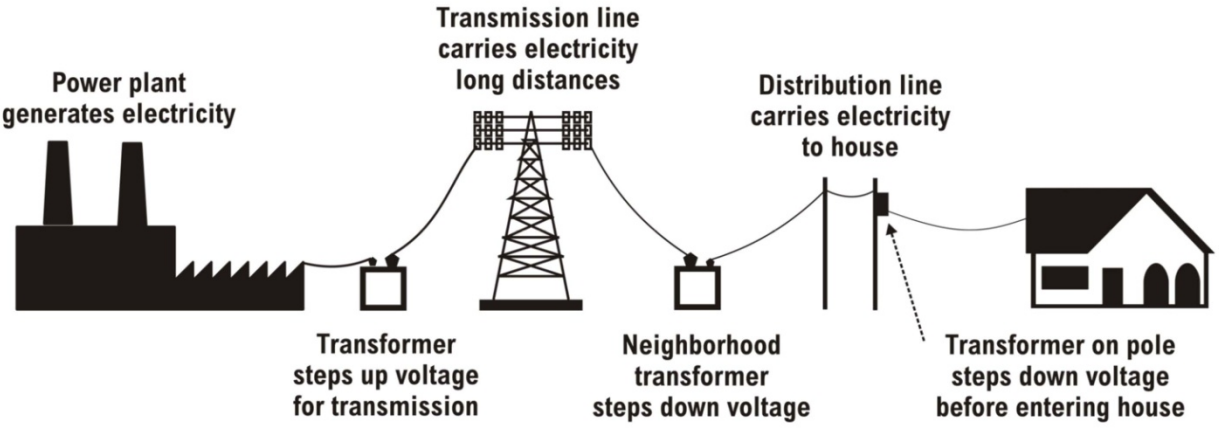
Including a higher percentage of renewable resources will present new challenges; traditional gas-fired power plants will be required to ramp up or down to match daily use patterns and sudden changes in electricity production from wind or solar resources.

Power plants of various types generate electricity. The electricity is fed to high voltage transmission lines (for example, 500,000 volts or 500 kV) that may run hundreds of miles. The power lines eventually go into substations near businesses, factories, and homes. Here transformers change the very high-voltage electricity back into lower voltage electricity.

From these substations electricity in different power levels is used to run factories, mass transit, street lights and stop lights, and is sent to neighborhoods. A small transformer mounted on a pole or in a utility box converts the power to even lower levels to be used in the home. The reduced voltages power larger appliances, like stoves and clothes dryers (220 volts), and lights, TVs and other smaller appliances (110 volts). Figure 1.2 shows the electricity transport steps.

Figure 1.2: Transporting Electricity

http://www.need.org/needpdf/infobook_activities/IntInfo/Elec1I.pdf



Source: Intermediate Energy Infobook

Electricity generation and transmission processes come with their own vocabulary. Terms that are frequently used in electricity planning include:

Adequacy – Having sufficient resources to provide customers with a continuous supply of electricity at the proper voltage and frequency, virtually all of the time. "Resources" refers to a combination of electricity generation and transmission facilities, that produce and deliver electricity; and "demand-response" programs, which reduce customer demand for electricity.

Baseload generation – Electricity generated from a power plant that is designed and intended to provide a steady supply of electricity for many homes during the year (at least 60 percent of its annual capacity). Examples are nuclear and geothermal power plants.

Bulk power system – The part of the overall electrical system that includes the generation of electricity and the transmission of electricity over high-voltage transmission lines to distribution entities.[1] The bulk power system includes electricity generation facilities, transmission lines, interconnections between neighboring transmission systems, and associated equipment. It does not include the local distribution of the electricity to homes and businesses.

Demand – The amount of electricity required at any given time to meet customer needs.

Combined Cycle – Power plant where a gas turbine generator generates electricity and the waste heat is used to make steam to generate additional electricity via a steam turbine; this last step enhances the efficiency of electricity generation. Most new gas power plants in California are of this type.

Congestion – A condition that occurs when insufficient transmission transfer capacity is

[1] The distribution entities are generally investor owned utility companies, or publicly owned utilities and irrigation districts.

available to implement all needs simultaneously.

Demand response – Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.

Demand-side management (DSM) – Programs that encourage customers to use less electricity, to use it at different times of day, or allow system operators to interrupt their electricity supply during peak demand times.

Distribution – The local delivery of electricity to customers.

Generating facility – Power plants or other facilities where electricity is produced.

Generation – The process of creating electric energy by transforming other forms of energy into electricity.

Grid – The network of interconnected transmission lines that transport electricity from power plants and other generating facilities to local distribution areas.

Independent System Operator (ISO) – An independent entity that monitors and controls the electricity and transmission networks in real time, to maintain its integrity and regulate generating supplies to keep them balanced with customer demand.

Kilowatt – A unit of power equal to one thousand watts

Kilowatt-hour – A unit of power equal to one thousand watts used in an hour.

Load – The amount of electric power supplied to meet one or more end user's needs.

Megawatt- A unit of power equal to 1 million watts.

Megawatt-hour- A unit of power equal to 1 million watts used in an hour.

Peak demand – Greatest amount of kilowatts needed during a demand interval.

Peaker-or peaker power plant are generally simple cycle gas turbines (no steam turbine) that burn natural gas that can be turned on and off within minutes. Therefore they are usually used during peak demand periods for electricity, such as hot summer afternoons when air conditioners are running.

Right-of-Way – Land, property, or interest therein, usually in a strip, acquired for infrastructure such as electric power lines. The land is set aside as an easement or in fee, either by agreement or by condemnation.

Reliability – The ability to meet the electricity needs of end-use customers, even when unexpected infrastructure failures or other factors reduce the amount of available electricity.

Transmission – The transportation of electricity over high-voltage lines and equipment, from generating facilities or other transmission facilities, to a point where it is transformed into voltages usable by customers, and distributed to customers.

Electricity Planning and Permitting

The California Legislature, state agencies, electric utilities, and the California Independent System Operator (California ISO) play the major roles in electricity planning and permitting, although the role of local governments is increasing. (See sidebar.)

The Role of Local Governments

The role of local and Tribal governments in the planning and permitting of generation and transmission infrastructure is expanding. More generation facilities are using non-thermal technology, such as wind and solar photovoltaics (PV), or generate less than 50 MWs of power. The licensing of these types of facilities generally falls outside state jurisdiction. Additionally, greater opportunities exist for local and regional planning involvement. For example, the Energy Commission's transmission corridor designation process calls for extensive local government participation.

The California Legislature enacts laws that affect electricity infrastructure either directly, such as SB 1 in 2006, the Million Solar Roofs (Murray, Chapter 132, Statutes of 2006, § 4) and Renewables Portfolio Standard (SB 107 in 2006 and SB 1078 in 2002), or indirectly through bills such as the electric industry deregulation of Assembly Bill (AB) 1890 in 1996 (Statues of 1996, Chapter 854, Brulte) and AB 32 in 2006, the Global Warming Solutions Act (Nunez, Chapter 488, Statutes of 2006).

The California Energy Commission is responsible for designating transmission corridors within California and permitting thermal power plants with a generating capacity of 50 megawatts (MW) or larger. If less than 50 MW or non-thermal, the local agency or state or federal lead agency would permit the project depending on jurisdictional requirements. The Energy Commission prepares a biennial *Integrated Energy Policy Report* (*IEPR*) which projects future electricity demand and identifies the regulations and policies that affect how that demand will be met. It also prepares the biennial *Strategic Transmission Investment Plan* (*STIP*), which identifies and recommends actions to implement infrastructure investments needed to ensure reliability, relieve congestion, and meet future load growth.

The electric utilities, including the investor-owned utilities (IOUs) and publicly owned utilities (POUs), plan the strategies for meeting the generation and transmission needs within their own service territory.

The California Public Utilities Commission (CPUC) regulates the IOUs – Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E). The IOUs are publicly traded corporations that provide electrical service for customers and earn profits for shareholders. The CPUC approves the power purchase contracts entered into by the IOUs to meet projected electricity demand and oversees the permitting process for any transmission lines built by the IOUs.

The California ISO prepares and publishes an *Annual Transmission Plan* (*ATP*) that identifies upgrades to the transmission system grid that will be needed over a 10-year time horizon. It addresses only transmission associated with the IOUs. Once the need for these system upgrades is established by the ATP, it is the responsibility of the IOUs to seek permits for these transmission facilities from the CPUC. The California ISO is also responsible for approving all new generator interconnections to the IOU transmission grid.

The IOUs submit their transmission planning considerations to the California ISO's ATP Process. They also submit their future transmission project priorities for consideration in the Energy Commission's STIP process and information to the CPUC on their long-term procurement needs. The IOUs periodically put forth requests for offers (RFOs) for certain power needs, such as renewable energy. Independent generators respond to the offers with proposals for power from new proposed or existing facilities. The CPUC oversees the process to ensure that the proposed generation would provide the lowest cost to the customer and the best fit to the utility's portfolio.

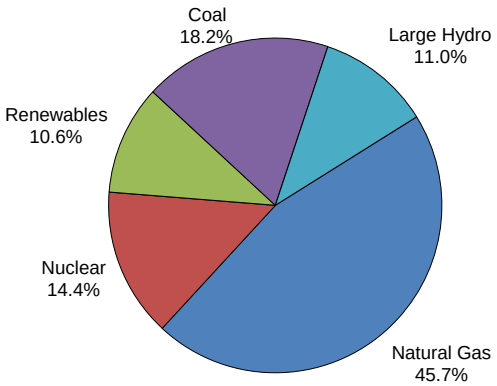
Municipal electric utilities (also known as POUs) are not overseen by the CPUC nor do they participate in the California ISO planning process. POUs are governed by elected boards and must seek their board's approval for new generation and transmission. The POUs do submit their future transmission project priorities for incorporation into the Energy Commission's STIP process. In 2009, the California Transmission Planning Group (CTPG) was formed to provide joint statewide planning and development of transmission projects. The CTPG includes the IOUs, POUs, merchant generators (See below), and the California ISO.

Merchant generators (also known as independent power producers or IPPs) develop their own electricity generation facilities and transmission lines and then sell the commodity to utilities.

Current Energy Infrastructure

California's electricity system is powered by a large, diverse mix of nearly 1,000 power plants that currently generate about 67,000 MW. In-state generation is supplemented by imports from the Southwest (generated primarily from coal, nuclear, and natural gas) and the Northwest (primarily from hydro with some coal and gas) that average about 20 percent of the state's annual total demand to 30 percent in some years. A look at California's electricity generation by sector is shown in Figure 1.3.

Figure 1.3: Electricity Generation by Sector, 2008



Source: California Energy Commission

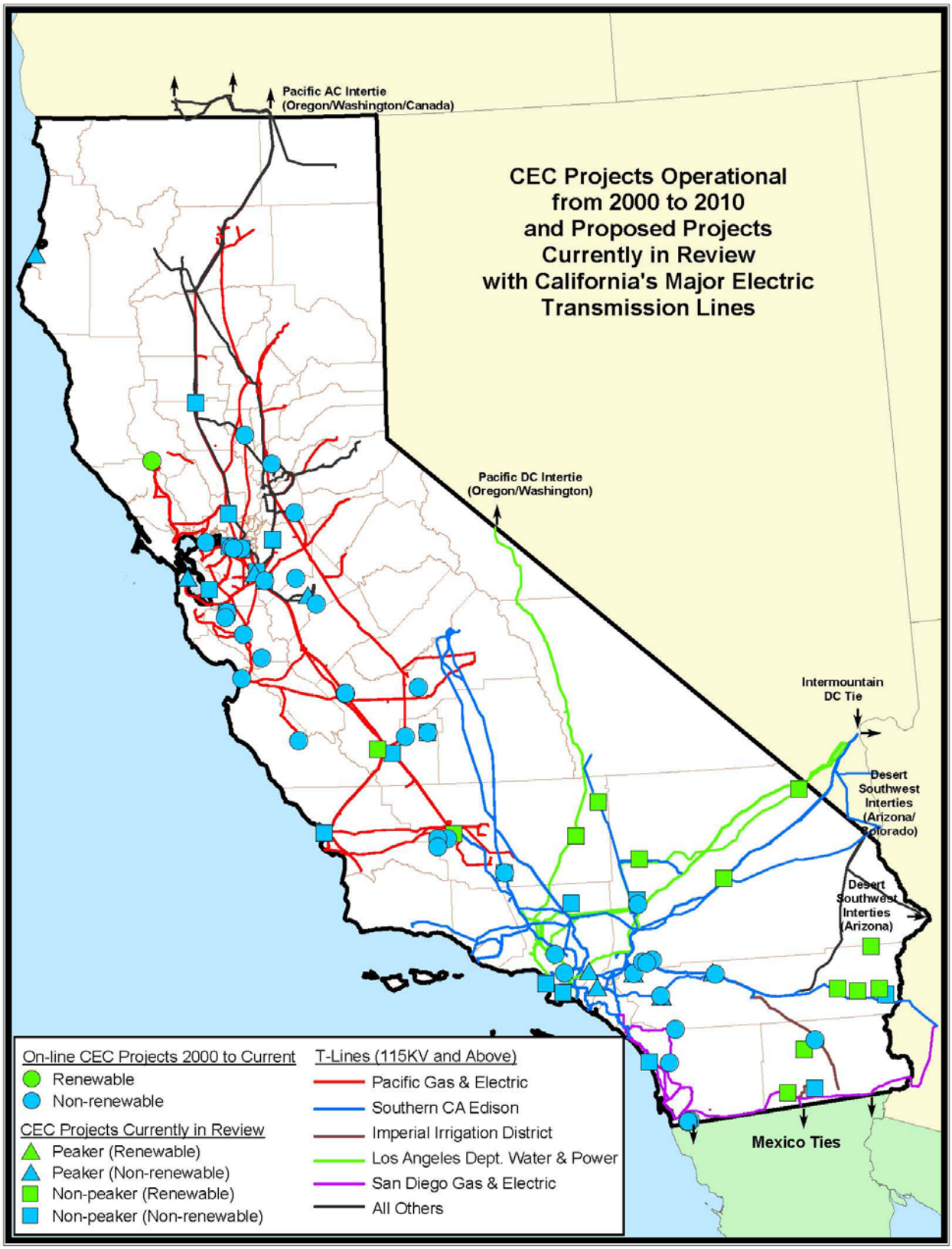
California power plants are located throughout the state, as shown in Figures 1.4. Newly approved power plants or proposed plants currently under review by the Energy Commission are concentrated in the San Francisco Bay Area, Central Valley, and the desert areas of Southern California. New, highly efficient, combined cycle natural gas-fired power plants will continue to be built in California to meet load growth and replace retiring generation infrastructure.

Furthermore, a number of the older plants are located along California's coast, using once through cooling (OTC) technology with ocean water. The California State Water Resources Control Board has adopted regulations requiring that the owners of these facilities retrofit these facilities to greatly reduce the intake of marine species by 2024, or cease the OTC operation entirely. OTC plants are presented in more detail in Chapter 3.

In addition, recent advances in turbine technology have increased thermal efficiency and lowered emissions rates so simple cycle, cost-effective peaker plants can be built and used widely to meet peak demand, particularly to compensate for the intermittent nature of renewable resources. For example, NRG's proposed 558 MW Carlsbad Energy Center would feature a rapid response combined cycle with partial to full startup within 10 to 20 minutes.

Major transmission lines occur throughout the state although they are heavily concentrated in areas of high population (which equates to electricity load/high demand). The location of these lines is shown in Figure 1.4. New transmission lines are being proposed to link remote renewable generation facilities to load centers.

Figure 1.4: California Statewide Projects Operational From 2000 to 2010



Source: California Energy Commission

Chapter 2: Planning and Regulatory Structure for Development of Generation and Transmission

This chapter identifies how future generation and transmission in California is determined and the process for implementing generation and transmission infrastructure. This chapter provides information to help local governments better understand the planning, permitting, and development of generation and transmission facilities.

Identifying Future Generation and Transmission Need

The following is a brief description of how the state and utility providers identify the need for energy generation and transmission.

Planning Documents

A number of state planning documents are used to identify California's energy requirements for future years. These planning reports are often used in conjunction and are designed to aid decision makers in identifying energy requirements.

Energy Action Plan. The *Energy Action Plan I* was adopted in 2003 by the Energy Commission, CPUC, and Consumer Power and Conservation Financing Authority (now defunct) with the goals of:

- Meeting California's energy growth needs including optimizing energy conservation and efficiency.
- Ensuring reliable, affordable, and high-quality power supply.
- Accelerating the state's goals for renewable energy.
- Upgrading and expanding the transmission system in the state.
- Promoting distributed generation.
- Ensuring a reasonably priced supply of natural gas.

The *Energy Action Plan II* (*EAP II*) was adopted by the Energy Commission and CPUC in 2005 and expanded the goals of the *Energy Action Plan I*. *EAP II* continues the strong support for the *loading order* that describes the priority sequence for actions to address increasing energy needs. The loading order identifies energy efficiency and demand response as the State's preferred means of meeting growing energy needs. After cost-effective efficiency and demand response, the second priority is renewable sources of power and distributed generation, such as combined heat and power applications. To the extent efficiency, demand response, renewable resources, and distributed generation are unable to satisfy increasing energy and capacity needs, the state will look to clean and efficient fossil-fired generation. *EAP II* identified specific actions to ensure adequate, reliable, and reasonably priced electrical power for California consumers and taxpayers. Its action areas included:

- Increasing the role of energy efficiency to meet California's energy needs.
- Incorporating demand response into the utility distribution network including modern information and control systems technologies.

- Aggressively developing renewable energy resources to meet the Renewables Portfolio Standard (RPS) and reduce greenhouse gases.
- Ensuring electricity adequacy, reliability, and infrastructure, in coordination with the Western electrical system to foster sound energy market rules.
- Ensuring a reasonably priced, long-term supply of natural gas, gasoline, and diesel while working toward an efficient, multi-fuel transportation market.

EAP II also focused on research and development for new energy technologies and reducing GHG emissions from the transportation sector.

Integrated Energy Policy Report. SB 1389 (Bowen, Chapter 568, Statutes of 2002) requires that the Energy Commission adopt a report of findings, the *Integrated Energy Policy Report* (*IEPR*), which must incorporate "assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices." The Energy Commission must use this information to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety. The Energy Commission prepares these assessments and associated policy recommendations every two years with updates in alternate years. As part of the *IEPR*, the Energy Commission forecasts electricity demand biennially in a *California Energy Demand* document. Additionally, the Energy Commission annually prepares a summer peak demand forecast.

Strategic Transmission Investment Plan. SB 1565 (2004) requires that the Energy Commission, in consultation with the CPUC and the California ISO, adopt a strategic plan for the state's electric transmission grid. This plan must also be included in the IEPR and acknowledges the state's role in the transmission planning process and the need to balance reliability, cost, and environmental criteria. The *Strategic Transmission Investment Plan* (*STIP*) describes actions that California can take to plan, permit, construct, operate, and maintain a cost-effective and reliable transmission system. The STIP considers California and western state initiatives, trends, and drivers that affect the integration of state policies, such as the RPS, into the transmission planning process.

California ISO Annual Transmission Plan. The California ISO directs delivery of energy across the transmission grid for the IOUs and any POUs that use the California ISO for their central area operator. As part of this process, it annually assesses the reliability of the transmission network under its control. The California ISO planning process spans 15 months and is a collaboration of different stakeholders, including developers. It publishes the *California ISO Transmission Plan*, which identifies short-term grid upgrades and long-term infrastructure plans that incorporate state and federal policy

initiatives. Based on the results, which considers reliability and economic transmission needs, the California ISO identifies projects to recommend for approval.

California ISO 33 Percent Renewables Transmission Plan. In October 2009, the California ISO published the *Getting to 33 percent RPS Through Comprehensive, Statewide Grid Planning: A Second Revised Straw Proposal*. This document focused on the transmission infrastructure needed to achieve a 33 percent RPS. The California ISO considered this a statewide plan to be developed with the California Transmission Planning Group (CTPG) building on the work done by the Renewable Energy Transmission Initiative (RETI) stakeholder process. The California ISO proposed a three-phased approach. The first phase would develop a 33 percent RPS conceptual transmission plan provided to the California ISO Board in early 2010, followed by stakeholder review and amendments. The second phase would refine the initial plan and submit a final plan to the California ISO Board in late 2010 for approval of elements within the California ISO's authority. The third phase will determine the need for specific projects submitted for approval. Projects within the California ISO authority area would be submitted to the California ISO Board for approval beginning in March 2011. Projects approved by the California ISO are submitted by the IOUs to the CPUC for environmental permitting and Certification of Public Convenience and Necessity (CPCNs).

California ISO has merged the two transmission planning processes into the Revised Transmission Planning Process (RTPP).

Utility Procurement Plans

In addition to energy generation and transmission planning, utility companies have long-term (10-year) procurement plans that serve as the basis for the type and amount of electricity utilities will buy. Every two years, the CPUC holds a Long Term Procurement Plan (LTPP) proceeding to review and approve IOU procurement plans. The LTPP proceeding evaluates the IOUs' need for new generation resources and establishes rules for rate recovery of energy procurement. The LTPP ensures that the IOUs maintain a set amount of energy above what they estimate they will need to serve their customers (called a *reserve margin*), and implement a long-term energy planning process. The LTPP also serves as the "umbrella" proceeding to consider, in an integrated fashion, the *Energy Action Plan* loading order resource policies and programs, including IOU compliance with the RPS.

POUs are required to submit an integrated resource plan to the Western Area Power Administration (WAPA) as required by the federal Energy Policy Act of 1992. WAPA markets and delivers hydroelectric power within a 15-state region of the central and western United States. Requirements for the integrated resource plan include identifying resource options and the timeframe the utility needs to implement specific actions defined in the plan. The POUs must discuss

their efforts to minimize adverse environmental effects of the resource procurement options and allow for full public involvement in the preparation and development of the integrated resources plan. Additionally, the POUs must conduct a load forecast for the plan and measure how the objectives set out in the plan are met. POUs must submit to the Energy Commission information on their resource mix, status in implementing the RPS, and renewable energy resource programs.

Generation Facility Implementation Process

The construction of new generation facilities involves a number of processes. As stated above, the utilities develop long-term plans identifying the need for new natural gas and renewable resources.

The CPUC requires that IOUs issue annual solicitations for energy. Energy generators file notices to bid on the solicitation and submit these bids to the IOUs. The IOUs evaluate the bids based on a "least-cost, best-fit" evaluation process and submit a list of bids to the CPUC. (See sidebar.) The IOUs and bidders negotiate a power purchase agreement (PPA), or contract between an electricity generator and a purchaser of capacity or energy, and execute contracts that are reviewed and approved or rejected by the CPUC. Capacity is electricity that is available for use in any hour of the year but is only requested when a need arises, and energy is a KWh of energy that is purchased for use in a particular hour.

Least-Cost, Best-Fit Criteria

Market Valuation: Such as energy prices, production costs to serve customer demand and transmission costs.

Portfolio Fit: Such as total energy produced and time of delivery.

Credit and Collateral: Such as demonstrating financial strength and creditworthiness.

Project Viability: Such as participant experience and the likelihood of obtaining required permits.

Other Qualitative Factors: Such as location, renewable portfolio standards, water quality impacts, and benefits to minority and low-income areas.

Source: California State Auditor, 2008

The POUs similarly identify their energy needs and solicit bids from generators. However, decisions on energy procurement are overseen by the POU's board of directors rather than the CPUC.

A proposed generation facility in California must go through an environmental review and permitting process subject to the California Environmental Quality Act (CEQA). The environmental review process may also be subject to the National Environmental Policy Act (NEPA), the federal environmental review process. As many of the utility-scale renewable energy generation facilities are proposed on federally owned land in California, both CEQA and NEPA reviews are required.

Before 1975, utilities were required to go through a multi-year process to obtain permits from numerous federal, state, and local agencies before constructing new

power plants. The Warren-Alquist Act established the California Energy Commission in 1975 and mandated a comprehensive siting process for new power plants. (See Chapter 3 for more details on the Warren-Alquist Act.) The Legislature gave the Energy Commission the statutory authority to license thermal power plants of 50 MW or greater along with the transmission lines, fuel supply lines, and related facilities to serve them.

Applicants for generation facilities that fall in this category submit engineering designs and detailed environmental information on the impacts of the project in their application for certification (AFC). Energy Commission staff then conducts an independent assessment of the proposed energy facility. The staff must review the information provided by the applicant, coordinate with federal, state, and local agencies and Tribal governments, perform necessary field and technical studies, and prepare expert witness testimony regarding the project. A staff assessment (SA) is prepared that is the functional equivalent of a draft environmental impact report (EIR). The SA information, testimony provided by intervenors, and public comments from other interested parties are considered by an Energy Commission committee chaired by two Commissioners during an evidentiary hearing. The committee prepares a proposed decision for a vote by the full commission. The process generally takes between 12 and 18 months. Chapter 5 provides more detail on permitting processes.

Local governments, primarily counties, review and permit some electricity-generating projects (solar photovoltaic, wind energy, and thermal projects smaller than 50 MW). The permits typically require similar analysis under CEQA (and NEPA, if applicable) and other applicable state laws and ordinances. Some counties have established specific county ordinances for permitting generation facilities, and designation of areas suited for transmission lines corridors.

The Federal Energy Regulatory Commission (FERC) licenses and inspects private, municipal, and state hydropower projects. The license includes overseeing environmental matters and issuing an environmental assessment (EA) or environmental impact statement (EIS) as required.

After the approval of any generation facility, construction financing must be in place. Construction of the facility may begin subject to certain conditions (conditions of certification or mitigation measures) established by the need to reduce the environmental impacts of the project. Chapter 7 describes the environmental issues associated with generation facilities and transmission lines.

Transmission Infrastructure Implementation Process

Utilities review their anticipated electricity needs and determine whether new transmission lines are needed to access future sources of electricity or to address other transmission issues such as congestion. The generation and

transmission facilities need to be balanced and synchronized to provide a reliable electricity system serving all of California. As mentioned earlier in this chapter, the IOUs, POUs, and the California ISO are working within the CTPG to develop a statewide transmission plan. The IOUs then present their transmission plans for review and approval to the California ISO, which decides what electrical upgrades are needed to add a line to the California grid. California ISO also performs an economic and reliability analysis to determine the value of the line to the California electricity system. Power plant generators requesting interconnection with the grid sign either large generator (>20 MW) interconnection agreements (LGIA) or small generator interconnection agreements (SGIA) with the California ISO to determine their share of costs associated with any needed upgrades.

IOUs are then required to obtain a permit from the CPUC for construction of certain transmission infrastructure. The CPUC Transmission Siting and Environmental Permitting Section conducts and manages environmental reviews for consideration by the CPUC Commissioners. The IOU prepares a proponent's environmental assessment (PEA) and preliminary engineering for the project and also files an application for a certification of public convenience and necessity (CPCN) for transmission lines greater than 200 kV or a Permit to Construct (PTC) for lines 50 kV to 200 kV. (Projects below 50 kV are considered to be distribution projects, rather than transmission projects, and in general do not require Commission approval.) The CPUC takes approximately 12 to 18 months to process the application and complete the CEQA process. The CPUC staff manages preparation of an EIR or a joint EIR/EIS if the project crosses federal lands and is also subject to NEPA.

If the transmission project is approved, additional state resource agency permits, issued by the State Water Resources Control Board (SWRCB), California Department of Fish and Game (CDFG), and permits from counties, may be required. Federal permits may also be required, such as those issued by the U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (USFWS).

Some POUs, including the Sacramento Municipal Utility District (SMUD), Los Angeles Department of Water and Power (LADWP), and Imperial Irrigation District (IID), control and operate transmission and distribution systems. As with the IOUs, the POUs plan and build large-scale transmission systems. POU transmission plans must be approved by the utility's board and adhere to applicable laws, rules, and regulations, including CEQA. The public agencies evaluate if there is a possibility the project may have a significant effect on the environment, and if there is more than one public agency involved, a lead agency is designated. The lead agency performs an initial study and determines if the transmission project significantly impacts the environment and prepares the appropriate environmental review. If the POU determines that the project would have a significant impact on

the environment, it prepares an EIR. The final EIR must be considered and certified by the decision-making body of the POU. As with the IOUs, if the project is approved, additional local, state, or federal permits may be required.

Chapter 3: Key Existing and New Laws/Policy Shaping Generation and Transmission

This chapter identifies the key existing and new laws and policies that shape generation and transmission in California. Information is provided to help local governments better understand why certain generation and transmission projects are proposed and permitted.

New Laws/Policies Promoting Renewable Resources

The following describes recent laws and policies that require that more electricity be generated from renewable resources.

California Laws/Policies

In 2002, the California Legislature approved SB 1078 (Sher, Chapter 516, Statutes of 2002) which created California's Renewables Portfolio Standard (RPS). The RPS required IOUs to increase renewable energy as a percentage of their retail sales by at least 1 percent annually until they reach 20 percent by 2010. POUs were not required to meet the same RPS as IOUs but still had to implement and enforce their own RPS program. The Energy Commission and the CPUC were directed to work collaboratively to implement the RPS, and specific roles were assigned to each agency. As of April 2010, the three large IOUs collectively served 15 percent of their 2009 retail sales with renewable power.

In 2006, the California Legislature passed Assembly Bill 32, the Global Warming Solutions Act of 2006. This established the goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2020. AB 32 includes the use of regulatory market mechanisms to achieve real and measurable GHG reduction targets. The California Air Resources Board (ARB) is the lead agency for implementing AB 32. The California ARB published the *Climate Change Scoping Plan* in December 2008. This document outlines strategies for meeting AB 32 goals and contains a range of GHG reduction actions that must be adopted by the ARB and other state agencies by the start of 2011.

The *Climate Change Scoping Plan* identifies recommended actions to reduce greenhouse gas emissions from key sources. For the electricity sector, the primary recommendations are to:

- Implement a broad-based California cap-and-trade program to provide a limit on emissions.
- Maximize energy efficiency in building and appliance standards; pursue new energy efficiency efforts including technologies; and pursue investment in energy efficiency from all providers of electricity in California.
- Achieve a 33 percent renewable energy mix statewide by 2020.
- Install 3,000 MW of solar electric capacity under California's existing solar programs (Million Solar Roofs).
- Expand the use of green building practices including maximizing energy and resource efficiency.

The Governor's Executive Order S-06-06 (2006) established a target to increase the use of biomass for electricity to 20 percent of the established state goals for renewable

generation by 2010 and to maintain this level through 2020. The state's *Bioenergy Action Plan* requires the Energy Commission to prepare *A Roadmap for the Development of Biomass in California* to focus public input and discussion on actions needed to achieve the targets set by the executive order. In 2008, the Energy Commission's Public Interest Energy Research (PIER) division published *An Assessment of Biomass Resources in California, 2007*, which evaluated the potential for California biomass both statewide and at the county level. The principal sources of biomass in California are residues from forestry/forest products, agriculture and urban sources (for example, municipal wastes). State biomass resources are sufficient to supply a substantially larger amount of renewable electricity than is presently generated. However, air quality issues make permitting a biomass facility difficult. (See Chapter 7.)

Executive Order S-14-08 (2008) established accelerated RPS targets (33 percent by 2020) as recommended in the *Energy Action Plan II*. The executive order directs the state government agencies to implement the 33 percent RPS target in regulatory proceedings, including siting, permitting, and procurement for renewable power plants and transmission lines. The order called for the formation of the Renewable Energy Action Team (REAT), composed of the Energy Commission, California Department of Fish and Game, U.S. Department of the Interior Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service. These organizations signed a memorandum of understanding in November of 2008. The team's primary goal is to streamline and expedite the permitting processes for renewable energy projects while conserving endangered species and natural communities at the ecosystem scale. More information regarding the 33 percent RPS can be found at Renewables Energy Portfolio Standards Proceeding - Docket # 03-RPS-1078.

The executive order also directs the REAT to develop a Desert Renewable Energy Conservation Plan (DRECP) for the Mojave and Colorado Desert regions. The DRECP will identify areas suitable for renewable energy project development and areas that will contribute to the conservation of sensitive species and natural communities. Please see Chapter 4 for further discussion of the DRECP. Related to the DRECP, the Executive Order also directed the REAT to develop and publish a Best Management Practices (BMPs) manual and other interim guidance for assisting project developers in designing projects to emphasize siting considerations and minimize environmental impacts for RPS desert projects. The California Legislature passed two legislative bills in the 2009 legislative session, SB 14 and AB 64, mandating a 33 percent RPS (similar bills have been introduced in the 2010 legislative session). The bills would have limited the amount of renewable power that could be provided by out-of-state facilities. Governor Schwarzenegger vetoed both SB 14 and AB 64, arguing that the bills as drafted would make achieving a 33 percent RPS target more difficult and costly. Instead, the Governor issued

Executive Order S-21-09 (2009), which directs the ARB to adopt regulations consistent with the 33 percent renewable energy target by July 31, 2010. The ARB must work with the CPUC and Energy Commission to ensure that regulations adopted under the authority of AB 32 encourage the creation and use of renewable energy sources. ARB held three workshops (October and December 2009, February 2010) to discuss a proposed regulation for a Renewable Electricity Standard (RES) regulation designed to implement EO S-21-09. A proposed regulation and staff report was issued in June 2010.

In October 2007, the CPUC adopted an initiative requiring that all new residential construction in California be "zero net energy" (consuming no more energy in a year than they would produce with solar power or other on-site renewable energy sources) by 2020 and all new commercial construction in California be zero net energy by 2030. The Energy Commission has indicated that it intends to develop building and appliance standards in support of the CPUC directive. In addition to "zero net energy" construction, there is discussion regarding "zero peak energy use" (buildings that do not require additional energy during peak energy use times,), and "net zero carbon" (buildings that generate more clean energy onsite than they use from the grid in an average year.) policies.

"Zero net energy" buildings require collaboration among the Energy Commission, CPUC, ARB, and local governments who have the authority over land use development and planning. The Energy Commission has adopted strategies to achieve the "zero net energy" goal, including: more standards for consumer electronics, water efficiency, improving education about energy efficiency, and green building standards. The Home Energy Rating System (HERS) Phase II program, effective as of September 2009, adopted a home energy rating scale. The Energy Commission's *2007 IEPR* recommends additional programs targeting heating and cooling technologies. The "zero net energy" policy and additional policies such as the "net zero carbon" will likely increase roof-top solar and other small-scale renewable facilities on both the customer and utility side of the meter.

Smart Grid

In October 2009, SB 17 (Padilla, Chapter 326, Statutes of 2009) was signed into law and requires the CPUC, Energy Commission, California ISO, and other stakeholders to determine the requirements for a smart grid deployment plan to improve overall efficiency, reliability, and cost-effectiveness of electrical system operations, planning, and maintenance by July 2010.

This draft Decision (D.) 09-09-029, by the CPUC provides Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company with the guidance needed to file smart grid deployment plans with this Commission by July 1, 2011.

As the CPUC stated in its decision, modernizing the electric grid with

additional two-way communications, sensors and synchronized control technologies, key components of a smart grid, can lead to substantial benefits for consumers. A smart grid can enable the integration of higher levels of renewable energy, energy storage, and, eventually, electric vehicles and high speed rail, at a lower cost to consumers. A smart grid can also empower consumers by helping them understand and control their energy use, thereby facilitating their participation in demand response programs and helping them to use energy more efficiently. Greater monitoring and automated controls can also reduce the frequency and duration of outages. Many of the advantages of a smart grid will contribute to reducing greenhouse gas emissions. It is imperative that smart grid investments deliver these benefits to the utilities' customers.

The California Legislature and Governor have enshrined the importance of modernizing the state's electric grid through the enactment of SB 17, signed into law on October 11, 2009. SB 17 states that "[i]t is the policy of the state to modernize the state's electrical transmission and distribution system to maintain safe, reliable, efficient, and secure electrical service, with infrastructure that can meet future growth in demand" and achieve purposes specified in the law. SB 17 further requires the Commission "by July 1, 2010, and in consultation with the State Energy Resources Conservation and Development Commission (Energy Commission), the Independent System Operator (ISO), and other key stakeholders, to determine the requirements for a smart grid deployment plan consistent with the policies set forth in the bill and federal law."

Under SB 17, this proceeding, in consultation with the Energy Commission and the ISO and other key stakeholders, sets the requirements for smart grid deployment plans. This decision requires that utilities follow a common outline in preparing their smart grid deployment plans. The outline consists of eight topics as follows:

1. Smart Grid Vision Statement
2. Deployment Baseline
3. Smart Grid Strategy
4. Grid Security and Cyber Security Strategy
5. Smart Grid Roadmap
6. Cost Estimates
7. Benefits Estimates
8. Metrics

In addition, this decision sets requirements for each of these sections concerning the topics that the smart grid deployment plans must address, the information that the deployment plans must provide, and how the deployment plans must link each section and topic back to the policies set forth in SB 17 and in relevant federal law. Furthermore, the authors anticipate that workshops hosted by the Energy Commission concerning research on "Defining the Pathway to the Smart Grid of 2020" and workshops hosted by this Commission prior to the filing of the initial

smart grid deployment plans will provide further opportunities for cooperation with the Energy Commission and the ISO.

The decision requires that the smart grid deployment plans present a vision of the smart grid consistent with legislative initiatives. The vision must address how the plans will enable consumers to capture the benefits of a wide range of energy technologies and energy management products and services that may, or may not, be provided by the utility, while protecting consumers' privacy. The vision must also discuss how the smart grid will help the utility meet environmental policies already adopted by statute or Commission action, and promote innovation and competition among companies developing new products and services.

The decision requires that the smart grid deployment plans provide a deployment baseline so that planners understand the character of the California grid today and articulate a strategy for achieving the adopted goals.

The decision requires each utility to address grid security and cyber security issues in their smart grid deployment plans to ensure that these issues are considered explicitly at the planning stage. The decision, consistent with the intent of SB 17, links California concerns for grid security with the security guidelines identified as under development by the National Institute of Standards and Technology. The decision also adopts security strategy requirements and principles to guide the development of smart grid deployment plans to ensure alignment with national efforts. Further, the authors anticipate a separate decision before the end of the year adopting privacy rules prior to the Commission ordering third-party access to customer data. A ruling will follow this decision setting a schedule for resolving privacy issues.

The decision provides a discussion of the cost and benefit procedures that the smart grid deployment plans should use to enumerate, quantify, and –- to the extent feasible –- monetize the costs and benefits of smart grid investments. The decision requires the plans to follow cost-effectiveness analysis to meet legislatively mandated goals in a cost-effective way and requires the presentation of the "business case" analysis for other components of the smart grid.

The decision also finds that the smart grid deployment plans should include metrics that permit the assessment of progress, but the adoption of specific metrics requires additional work by parties. A subsequent decision later this year will endorse specific metrics for inclusion in smart grid deployment plans and other reports.

This decision also proposes to review the initial deployment plans in a single proceeding. Subsequent utility requests to make specific smart grid-related investments, however, would occur in utility-specific proceedings where the reasonableness of particular smart grid investments can be determined.

Finally, this decision requires that the utilities file annual reports on their smart

grid activities, with the first annual reports due on October 1, 2012.

Federal Laws/Policies

The U.S. Department of Interior (DOI) is a key partner for renewable energy development in California. The DOI manages 500 million acres of surface land, or about one-fifth of the land in the United States. The Bureau of Land Management (BLM) manages 256 million acres of this land, including 15.2 million acres in California. Additionally, about 30 percent of the nation's energy is produced by energy projects on federally managed lands and offshore areas. Federal orders and laws require the DOI to evaluate energy generation projects and facilitate the development of renewable energy sources on public lands. BLM is currently processing 45 applications for solar (utility scale solar thermal and photovoltaic) projects for use of approximately 408,000 acres of BLM-administered land in California and 35 applications for wind projects for use of approximately 312, 400 acres (November 2010). Over one million acres of this land is in BLM's California Desert District. Facilities located on BLM lands must meet NEPA requirements and CEQA if the Energy Commission is the permitting agency.

Executive Order 13212, dated May 18, 2001, mandates that DOI agencies act expediently and in a manner consistent with applicable laws to accelerate the completion of projects that increase the "production, transmission, or conservation of energy."

The Energy Policy Act of 2005 (EPAct-05) Sec. 211 requires the DOI to approve at least 10,000 MW of non-hydropower renewable energy projects on public lands by 2015. Title XVII of EPAct-05 authorizes the Secretary of Energy to make loan guarantees for a variety of projects, including those that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." The two principal goals of the loan guarantee program are to encourage commercial use in the United States of new or significantly improved energy-related technologies and to achieve substantial environmental benefits. Renewable energy systems, efficient electrical generation, transmission, and distribution technologies, and efficient end-use energy technologies are eligible for a guarantee under Title XIII of the Energy Independence and Security Act of 2007.

Title XIII establishes a federal policy to modernize the electric utility transmission and distribution system to maintain reliability and infrastructure protection. Additionally, Title XIII requires the DOE to report to Congress any barriers to the deployment of smart grid technologies, conduct research and development strategies to assess energy savings and other aspects of implementation, and reimburse 20 percent of qualifying smart grid investments and allows utilities to recover smart grid investments through rates.

Secretarial Order 3283 *Enhancing Renewable Development on the Public Lands* (January 2009) facilitates the DOI's efforts to achieve the goals established in EPAct-05 Sec. 211. The Secretarial Order goals include designating Renewable Energy Coordination offices, improving efficiencies when processing renewable energy applications, developing Best Management Practices for renewable energy projects on public lands, and improving interagency coordination with other federal agencies. In October 2009, the BLM opened a Renewable Energy Coordination Office in California to support the permitting of power and transmission projects on public lands and to reduce BLM's existing pending applications and use new procedures to expedite the leasing, production, and delivery of renewable energy to consumers. The BLM California Energy website provides information regarding renewable and fossil fuel energy projects on BLM-administered lands in California.

Secretarial Order 3285 *Renewable Energy Development by the Department of Interior* (March 2009) established the development of renewable energy as a priority for DOI and established a Departmental Task Force on Energy and Climate Change. The Departmental Task Force will identify specific zones on U.S. public lands where the DOI can facilitate a rapid and responsible move to large-scale production of solar, wind, geothermal, and biomass energy. The task force will prioritize the permitting and environmental review of transmission rights-of-way applications that are necessary to deliver renewable energy generation to consumers. The secretarial order directs all DOI agencies and departments (including the BLM and U.S. Fish and Wildlife Service) to encourage the timely and responsible development of renewable resources, while protecting and enhancing the nation's water, wildlife, and other natural resources.

The BLM and U.S. Department of Energy (DOE) are considering agency programs that would facilitate utility-scale solar energy development in a Solar Energy Development Programmatic Environmental Impact Statement (Solar PEIS) in response to Executive Order 13212 and Secretarial Order 3285. This Solar PEIS, which is focused on the western states, is discussed in more detail in Chapter 4.

The American Recovery and Reinvestment Act of 2009 (ARRA) provides incentives to developers of renewable energy facilities and transmission lines. The ARRA includes approximately $6 billion in loan guarantees for renewable energy power generation and transmission projects and provides grants in lieu of tax credits of up to 30 percent of the cost of building a new renewable energy facility. To be eligible for the grants, a facility must be placed in service in 2010 or 2013, or construction of the facility must begin in 2009 or 2010. REAT is tracking project applications that may qualify for these funds. It has identified potential "fast-track" renewable applications that are furthest along in their application process and have the best chance of beginning construction by the end of December 2010, a key milestone date. The REAT released the *Milestones to Permit California Portfolio*

Standard Energy Projects by December 2010 to facilitate "fast-track" renewable projects.

In June 2009, Secretary Ken Salazar of the Department of Interior and Senator Harry Reid (D-NV) announced that federal agencies will work with western leaders to designate tracts of U.S. public lands in the West as prime zones for utility-scale solar energy development, fund environmental studies, open new solar energy permitting offices and speed reviews of industry proposals.

Under DOI's "Fast Track" initiative, 24 tracts of BLM-administered land located in six western states, known as Solar Energy Study Areas, will be fully evaluated in BLM's Solar PEIS for their environmental and resource suitability for large-scale solar energy production. The objective is to provide landscape-scale planning and zoning for solar projects on BLM lands in the West, allowing a more efficient process for permitting and siting responsible solar development.

In October 2009, an MOU was signed between the State of California and the DOI on Renewable Energy. The purpose of the MOU is to direct the California agencies and DOI agencies to further the Governor's Executive Order S-14-08 and the Secretary's Order 3285 in a cooperative, collaborative, and timely manner. Among its major provisions, the MOU would:

- Establish a Renewable Energy Policy Group of senior policy representatives to guide the cooperative work.
- Develop a strategy to identify areas suitable and acceptable for renewable energy development.
- Identify renewable energy zones based on renewable energy development potential and environmental, wildlife and conservation criteria.
- Prioritize application processing for solar development in renewable energy zones.
- Coordinate with federal and state agencies to identify energy and transmission needs and opportunities and designate transmission needs and corridors.

In December 2009, nine federal agencies issued a memorandum of understanding (MOU) to speed the siting of electric transmission lines on federal land. The goal was to create a single point of contact to coordinate all of the necessary federal approvals and create deadlines for project approval.

In May 2010, the REAT agencies signed a memorandum of agreement (MOA) to enable renewable energy projects proposed in the California desert to address mitigation requirements through the use of a deposit account rather than individually undertaking mitigation for each project.

Laws Affecting Permitting and Types of Electricity Infrastructure

Energy generation facilities in California must comply with a number of laws, ordinances, regulations, and standards.

Some laws relate to how electricity infrastructure is permitted, and some laws specifically prohibit certain types of electricity infrastructure.

The primary state laws governing permitting for the Energy Commission are the Warren-Alquist Act, CEQA, California Endangered Species Act, and Section 1600 of the Fish and Game code pertaining to streambed alterations. These laws, in addition to the Federal Endangered Species Act, Federal Clean Air Act, Clean Water Act, and Porter-Cologne Water Quality Control Act are discussed below. The full list of the laws, ordinances, regulations, and standards used in permitting energy facilities can be found in the *Energy Facility Licensing Process: Developers Guide of Practices and Procedures*.

Warren-Alquist Act

The Warren-Alquist State Energy Resources Conservation and Development Act, commonly called the Warren-Alquist Act, created and gives statutory authority to the California Energy Commission to certify the construction, modification, and operation of thermal electric power plants 50 MW or larger. The Energy Commission certification is in lieu of any permit required by state, regional, or local agencies and by federal agencies to the extent permitted by federal law. The Energy Commission must review power plant AFCs to assess potential environmental impacts including potential impacts to public health and safety, potential measures to reduce those impacts, and compliance with applicable governmental laws or standards. The Energy Commission can also review small thermal power plants between 50 MW and 100 MW and exempt the plants from detailed review.

Garamendi Principles

In 1988, in recognition of the value of the transmission system and need for effective long term transmission corridor planning, SB 2431 (Garamendi, Chapter 1457, Statutes of 1988) declared that it is in the best interests of the state to accomplish the following (Garamendi Principles):

- Encourage the use of existing rights-of-way by upgrading existing transmission facilities where technically and economically justifiable.
- When construction of new transmission lines is required, encourage expansion of existing rights-of-way, when technically and economically feasible.
- Provide for the creation of new rights-of-way when justified by environmental, technical, or economic reasons, as determined by the appropriate licensing agency.
- Where there is a need to construct additional transmission, seek agreement among all interested utilities on the efficient use of that capacity.

California Environmental Quality Act

CEQA was enacted in 1970 and requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or reduce those impacts, if feasible. When considering a power generating project for licensing, the

Energy Commission is the lead state agency under CEQA, and the Energy Commission's process is functionally equivalent to the preparation of an environmental impact report.

The Energy Commission staff prepares an independent assessment of the project's engineering design and identifies potential impacts on the environment and the public's health and safety, and determines whether the project conforms to all applicable laws, ordinances, regulations and standards (LORS). Each discipline must identify the method and threshold for determining the significance level of any impact caused by the project. Upon identifying any potentially significant environmental impacts, Energy Commission staff recommends mitigation measures in the form of conditions of certification for construction, operation, and eventual closure of the project.

California Endangered Species Act

The California Endangered Species Act of 1984 protects rare, threatened, and endangered plants and animals at a power plant site. The Department of Fish and Game (CDFG) works with all interested persons, agencies, and organizations to protect and preserve such sensitive resources and their habitats. "Take" of a state-listed species is prohibited without an Incidental Take Permit. *Take* is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The California Endangered Species Act allows for take incidental to otherwise lawful development projects. Incidental Take Permits are issued by the CDFG for projects that are not under the exclusive permitting authority of the Energy Commission.

Section 1600 of the Fish and Game Code

Waterways affected by a power plant are regulated by the Streambed Alteration Agreement. This agreement regulates activities that may divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake in California designated by the CDFG in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process. Streambed Alteration Agreements are issued by CDFG for projects that are not under the exclusive permitting authority of the Energy Commission.

National Environmental Policy Act

Congress enacted NEPA in 1969 and it was signed into law in 1970. NEPA requires federal agencies to undertake an assessment of the environmental effects of their proposed actions prior to making decisions. The environmental review process is designed to ensure better informed decisions and provide for citizen involvement.

Every agency in the federal government has a responsibility to implement NEPA. To

implement NEPA policies, Congress prescribed a procedure commonly referred to as the environmental impact assessment. NEPA's procedural requirements apply to a federal agency's decisions for an action, including financing, assisting, conducting, or approving projects or programs. Agency rules, regulations, plans, policies, or procedures and legislative proposals are also subject to a NEPA review.

Federal Endangered Species Act

The Federal Endangered Species Act (FESA) of 1973 requires that federal agencies seek to conserve threatened and endangered species through their actions. Section 9 of FESA prohibits the "take" of any fish or wildlife species listed under FESA as endangered. Section 9 applies not only to federal agencies but also to any local or state agency, and to any individual. If "take" of a listed species is necessary to complete an otherwise lawful activity, this triggers the need for consultation under Section 7 of FESA (for federal agencies), or requires preparation of a habitat conservation plan (HCP) under Section 10 of FESA (for state and local agencies, or individuals).

Under Section 7 of FESA, all federal agencies must, in consultation with the U.S. Fish and Wildlife Service (USFWS), ensure that their actions do not jeopardize the continued existence of listed species or destroy or adversely change critical habitat. Under Section 10 of FESA, the applicant for an "incidental take permit" is required to submit a "conservation plan" to USFWS that specifies, among other things, the impacts that are likely to result from the taking, the measures the permit applicant will undertake to minimize and mitigate such impacts, and the funding that will be available to implement those steps.

Federal Clean Air Act

The Federal Clean Air Act requires any new major stationary sources of air pollution (such as a thermal power plant) and any major changes to major stationary sources to obtain a permit before beginning construction. This process is known as New Source Review (NSR). Its requirements differ depending on the air quality attainment status of the area where the facility is to be located. Each geographic area is designated by either the U.S. Environmental Protection Agency (USEPA) or the ARB as a nonattainment or attainment area, depending on whether federal ambient air quality standards are violated. The state Clean Air Act also requires ARB to establish ambient air quality standards.

Responsibility for pollution from stationary sources lies with local air districts. County air pollution control districts and regional air quality management districts develop local attainment plans and issue permits to regulate stationary sources. The district rules and regulations specify the emissions control and offset requirements for new emissions sources such as power plants. These requirements are included in the determination of compliance (DOC) report for thermal power plants prepared by local districts and provided to the Energy Commission. The DOC is prepared in lieu of issuing a local air quality permit.

Emission reduction credits are limited in certain areas (for example, the South Coast Air Quality Management District – SCAQMD) and power plants have had difficulty obtaining sufficient credits to offset pollution from the plant. (See sidebar.)

Clean Water Act

Power plants must comply with Clean Water Act (33 USC § 1257 et seq.) requirements set by states to protect, maintain, and restore water quality. Although water quality standards are to be met through the regulation of point source discharges to surface water, Section 307 of the Act and Code of Federal Regulations 403 requires that all power plant discharges to wastewater treatment plants receive a pretreatment permit. This includes regulation of storm water discharges during construction and operation of a facility, normally addressed through attaining a general National Pollutant Discharge Elimination System (NPDES) permit.

The Clean Water Act protects navigable waters through Section 401. Section 401 certification through the Army Corps of Engineers and Regional Water Quality Control Board (RWQCB) is required if there are potential impacts to surface waters of the State and/or Waters of the United States, such as perennial and ephemeral drainages, streams, washes, ponds, pools, and wetlands. Section 401 requires impacts to these waters to be quantified and mitigated.

Emission Reduction Credits

The South Coast Air Quality Management District (SCAQMD) amended its rules in 2007 to require developers of power plants to have a one-year power sales contract and license from the Energy Commission before the SCAQMD board would release emission reduction credits. Municipal utilities were allowed only enough credits to build projects to serve their native loads. This rule, the Priority Reserve Rule, was challenged, and the 2008 court decision found the air district's CEQA analysis inadequate. The 2008 decision resulted in a one-year moratorium on the SCAQMD issuing permits to power plants.

Assembly Bill 1318 (V. Manuel Perez, Chapter 285, Statutes of 2009) and Senate Bill 827 (Wright, Chapter 206, Statutes of 2009) addressed the issue of credits. AB 1318 authorized the issuance of air credits to specific power plants satisfying eligibility criteria. Similarly, SB 827 authorized the SCAQMD to issue needed air credits for a limited number of specific plants meeting eligibility criteria. Environmental groups filed a lawsuit in December 2009 to block these actions. A state superior court judge ruled in favor of the SCAQMD in July 2010. However, for the Sentinel Power Plant, the, environmental groups have asserted that unless and until the U.S. EPA approves the transfer of SCAQMD's internal offset credits via a revision to the State Implementation Plan, the Energy Commission may not certify the CPV Sentinel project under AB 1318 because the credit and transfer by the SCAQMD does not satisfy all applicable legal requirements.

Porter-Cologne Water Quality Control Act of 1967

Power plants have typically used large amounts of water to cool waste heat; this takes place in cooling towers. The quantity and source of the water is controversial. The state Porter-Cologne Water Quality Control Act prohibits the use of water from any source of potable water for nonpotable uses, including industrial uses, if recycled water is available. State agencies are working closely together to phase out the use of ocean or bay water by power plants in California.

The state Water Code (Section 13552.6) considers using potable domestic water for cooling towers an unreasonable use of water, if suitable recycled water is available. The availability of recycled water is based upon criteria stipulating that the quality and quantity of the reclaimed water are suitable for the use; the cost is reasonable; and the use is not detrimental to public health, will not impact downstream users or biological resources, and will not degrade water quality.

The Water Code states that any public agency may require the use of recycled water in cooling towers if certain criteria are met. These criteria include that recycled water is available and meets the requirements set forth in Section 13550; the use does not adversely affect any existing water right; and if there is public exposure to cooling tower mist using recycled water, appropriate mitigation or control is necessary.

Williamson Act

The California Land Conservation Act (Williamson Act) Program was enacted in 1965 to ensure sufficient food supplies, discourage unnecessary conversion of agricultural lands, discourage leap-frog development, and to preserve open space. Williamson Act contracts currently cover one-third (16.6 million acres) of private land in California. The contracts are principally with counties, with only a few cities participating. Landowners with contracts realize lower property tax payments.

Solar (and wind) facilities may be located on land subject to the Williamson Act if one or more of the following conditions are met: the use is compatible; the contract is not renewed; the contract is cancelled; or the land is acquired through eminent domain. Determinations are very site/fact specific and require consultation with Department of Conservation (DOC) and local governments. More detail is provided in DOC's *Solar Power and the Williamson Act*. See Chapter 5 for examples of Williamson Act land conversions.

Coal Importation Limits

In September 2006, Governor Arnold Schwarzenegger signed into law Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006).which prohibits California utilities from entering into new long-term contracts for coal-generated electricity. In 2006, approximately 15.7 percent of the energy used in California came from coal fired sources; 38 percent of this was generated in state and 62 percent was imported. The in-state coal-fired generation includes

electricity generated from out-of-state, coal-fired power plants owned by California utilities.

SB 1368 precludes utilities from signing new long-term contracts for power that exceeds the rate of greenhouse gases emitted per megawatt-hour for combined cycle, gas turbine base-load generation. However, existing contracts with power plants were not regulated by SB 1368. As such, utility providers have continued to rely on coal-fired power plants and can do so until these contracts expire. An example of this is the LADWP, which contracts with two large coal plants whose contracts do not expire until 2019 and 2027.

Nuclear Power Plant Prohibitions and Relicensing

The fate of nuclear power plants in California is uncertain. New nuclear facilities are prohibited by law and California's two operating nuclear plants must undergo relicensing in the next 15 years. These plants (Diablo Canyon Power Plant and the San Onofre Nuclear Generating Station-SONGS) provide about 14 percent of the State's electricity.

In 1976, California enacted legislation directing the Energy Commission to perform an independent investigation of the nuclear fuel cycle. This investigation was to assess whether the technology to reprocess nuclear fuel rods or to dispose of permanently high-level nuclear waste had been demonstrated and approved and was operational. After extensive public hearings, the Energy Commission determined it could not make the requisite affirmative findings concerning either reprocessing of nuclear fuel or disposal of high-level waste. This information was published in a 1978 report: *Status of Nuclear Fuel Reprocessing, Spent Fuel Storage and High-Level Waste Disposal*. As a result, the development of new nuclear energy facilities in California is prohibited by law until the Energy Commission finds that the federal government has approved and there exists a demonstrated technology for the permanent disposal of spent fuel from these facilities.

The Energy Commission reviewed this issue again in 2007 (*Nuclear Power in California: 2007 Status Report*) and concluded that because no repository for spent fuel is likely to be built in the immediate future, California utilities should continue to plan for indefinite storage for spent fuel at their power plant sites. Because of this, and until progress is made in disposing of or reprocessing spent fuel, the Energy Commission could not provide land-use permits or certification for a new nuclear plant at this time, nor would it likely be able to do so in the near future.

The Nuclear Regulatory Commission (NRC) operating licenses for California's nuclear plants expire in 2022 (SONGS Units 2 and 3) and 2024 and 2025 (Diablo Canyon Units 1 and 2, respectively). SCE plans to file a SONGS license renewal application in late 2012. In November 2009, PG&E applied to the NRC to extend the operating licenses for the Diablo Canyon plants by 20 years. The NRC has never denied an application and has issued license renewals for 54 of the nation's 104 nuclear power reactors.

The NRC license renewal application process determines whether a plant meets the NRC renewal criteria. After an operating license is renewed, state regulatory agencies and owners of the plant decide whether to continue operating the plant based on factors such as need. The NRC license renewal proceeding focuses on plant aging issues, such as metal fatigue or the degradation of plant components, as well as environmental impacts related to an additional 20 years of plant operation. The NRC has consistently excluded from its proceedings issues raised by states and public interest groups including seismic issues that are not directly related to plant aging or to deficiencies in the environmental impact assessment.

SCE and PG&E must obtain CPUC approval to pursue license renewal before receiving California ratepayer funding to cover the costs of the NRC license renewal process. The CPUC proceeding will determine whether it is in the best interest of ratepayers for the nuclear plants to continue operating for an additional 20 years. The purpose of the CPUC license renewal review is to consider matters within the state's jurisdiction, including the economic, reliability, and environmental implications of relicensing. If the state's two nuclear facilities are not relicensed, additional sources of electricity would be needed. Because the two nuclear plants emit very low levels of carbon in comparison to other sources of electricity, additional carbon reductions would be needed to meet AB 32 goals.

Policies Affecting Siting and Permitting of Electricity Infrastructure

The following policies impact the siting and permitting of electricity infrastructure.

Limitations on Use of Fresh Water for Turbine Cooling

Fresh water is limited in California, and new policies restrict its use by power plants. The *2003 Integrated Energy Policy Report* established a policy on the use of fresh water for power plant cooling. California's population, businesses, and industries continue to use increasing quantities of fresh water at rates that cannot be sustained. Imbalances in available fresh water supply result in "average year" shortages projected in nearly every region. Energy facilities are among the state's many water users and have the potential to affect fresh water supply and water quality. Although water use for power plant cooling is relatively small on a statewide basis, it can cause significant impacts to local water supplies.

As stated in the 2003 report, degraded surface and groundwater can be used for power plant cooling. When sufficient quantities are available, reclaimed water is a commercially viable cooling medium. Alternative cooling options, such as dry cooling, are also available and commercially viable and can reduce or eliminate the need for fresh water.

State water policy regarding power plants is specified in Resolution 75-58 adopted by the State Water Resources Board (SWRCB). This policy encourages the use of wastewater for

power plant cooling where it is appropriate and limits the discharge of blowdown or waste waters from cooling facilities to maintain existing water quality and aquatic environments. The SWRCB further states that where it has jurisdiction, the use of fresh inland waters for power plant cooling would be approved only once it is demonstrated that the use of other water supply sources or methods of cooling are environmentally undesirable or economically unsound. The Warren-Alquist Act reiterates state water policy in terms of conserving water and using alternative sources of water supply: "It is further the policy of the state and the intent of the Legislature to promote all feasible means of energy and water conservation and all feasible uses of alternative energy and water supply sources."

Consistent with the SWRCB policy and the Warren-Alquist Act, the Energy Commission policy is to approve the use of fresh water for cooling purposes by power plants that it licenses only where alternative water supply sources and alternative cooling technologies are shown to be environmentally undesirable or economically unsound. Additionally, as a way to reduce the use of fresh water and avoid discharges in keeping with the Board's policy, the Energy Commission will require zero-liquid discharge technologies, meaning that the cooling water is continually reclaimed and reused and no water is released to the environment, unless such technologies are shown to be environmentally undesirable or economically unsound.

Limitations on Use of Ocean Water for Turbine Cooling

Similar to policies that eliminate the use of fresh water to cool the waste heat generated by new power plants, recent policies are phasing out the use of ocean or bay water for cooling of existing power plants. These plants are shown in Figure 3.1. In the *2005 Integrated Energy Policy Report*, the Energy Commission called for retirement, replacing, and/or repowering aging power plants (typically over 30 years old), which included plants using once-through cooling (OTC). The aging plants operate at high heat rates when compared with new technologies, resulting in less efficient use of natural gas and higher levels of pollutants, including GHG emissions.

The SWRCB has been developing an OTC mitigation policy and, in June 2009, published a draft policy that establishes closed cycle wet cooling towers as the benchmark for compliance and proposes a compliance schedule. See sidebar for a description of cooling options. This schedule is based on a proposal by the Energy Commission, the CPUC, and the California ISO on how to address reliability concerns given the proposed timeline for OTC mitigation compliance. The three energy agencies agreed that a fixed-year outer bound on OTC mitigation compliance can be established, provided it allows for the orderly development of necessary replacement infrastructure and can be amended if delays indicate this is needed to ensure reliability.

The CPUC, the California ISO, and the Energy Commission joint proposal would assure electrical grid reliability while reducing OTC in existing coastal power plants. *The Implementation of Once-Through Cooling Mitigation Through Energy Infrastructure Planning and Procurement* outlines this joint proposal. The proposal has three broad efforts. The agencies would first study the consequences of retiring individual or clusters of existing OTC power plants to identify generation or transmission options for replacing each OTC facility. Secondly, the agencies would review enhanced local capacity requirements to determine a strategy that would be compatible with broad energy policy preferences.

When the results of these studies were available, they would be entered into the CPUC Long Term Procurement Plan proceeding for further analysis. The goal of this step is to issue guidance to the IOUs to acquire generation resources and to the California ISO annual transmission planning process to identify specific transmission projects. Finally, the CPUC would approve necessary power plant additions, the Energy Commission would license them, and the CPUC would license necessary transmission projects.

Figure 3.1: California's Coastal Power Plants That Use Once-Through Cooling

Source: http://www.energy.ca.gov/2005publications/CEC-700-2005-004/CEC-700-2005-004-D.PDF pg. 13

Power Plant Cooling

Thermal power plants convert natural gas, geothermal fluid, coal, fuel oil, solar heat, nuclear or biomass energy to electric energy and waste heat. These power plants require a cooling process to remove heat from the power production cycle. Water and air are traditionally used for cooling power plant steam condensers and turbines. There are several types of cooling:

Once-through cooling. Water is withdrawn from the environment, passed through a steam condenser, and returned, heated, to the source. No water is consumed or evaporated within the cooling system. However, small aquatic organisms carried by the cooling water are killed by heat, turbulence, and/or chemicals and larger organisms are trapped against the cooling water intake screens.

Recirculating wet systems. Smaller amounts of water (typically 2 to 3 percent of that used in once-through cooling) are taken into the power plant and circulated continuously through cooling towers. The cooling system must be replenished with make-up water to replace water lost through evaporation.

Dry cooling. Air-cooled systems dissipate waste heat by convection, condensing the steam by circulating air with large fans. Power plants using air cooling systems for steam condensation still require small amounts of water to replenish the steam cycle and for cooling the air flowing through the gas turbines.

Hybrid cooling. In wet/dry systems, both wet and dry components are used in the system either separately or simultaneously depending on ambient conditions.

The Energy Commission is already discouraging power plant applications that use once-through ocean water or fresh water-cooling technologies. Therefore, the general concept being applied by the SWRCB regarding OTC is already accepted practice for new power plants.

The proposed compliance schedule for each OTC plant is based on the timeline required to create replacement infrastructure. The state will have to make significant planning decisions, procurement authorization, and permitting of specific energy infrastructure projects to accomplish the retrofitting, repowering, or retirement of about 30 percent of the power generation capacity in California. Phasing out of OTC at power plants could affect proposed desalination facilities. (See sidebar.)

In May 2010, the SWRCB adopted the Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling. The CPUC anticipates modifying its LTPP proceeding and procurement processes to require the IOUs to assess replacement infrastructure needs and to target new generation requests to replace, or repower this infrastructure. The replacements will be phased, and because the Los Angeles region presents a more complex and challenging set of issues, more time is likely needed to study and implement replacement infrastructure solutions. California ISO can notify the SWRCB that an existing power plant is necessary to maintain reliability, which could also modify the compliance dates identified in the policy.

Desalination Facilities at Coastal Power Plants

As California's water supply demand grows and supplies from out-of-state sources decline, the value of water increases along with the prospect for seawater desalination. Electricity costs are the most significant component of the cost of operating desalination plants, and seawater desalination is considerably more energy-intensive than brackish water desalination. Most desalination plants operate continuously, so the demand for their electricity is consistent during all seasons of the year and times of the day.

Because of the substantial amount of electrical energy required by a desalination facility, their preferred location is a coastal power plant site. By taking electricity directly from the power plant, a desalination project operator can eliminate the costs associated with transmission fees.

Desalination plants use considerably less ocean water than OTC plants. For example, the Carlsbad Desalination Project will use 50 million gallons per day (mgd) whereas the San Onofre Nuclear Generating Station uses 2,384 mgd.

Transmission Line ROW Widths

Laws and standards that provide for a reliable electricity grid affect where transmission lines can be placed. The North American Electric Reliability Corporation (NERC) and the FERC have standards to ensure a reliable source of energy. NERC develops and enforces reliability standards, assesses reliability annually, monitors the bulk power system, and educates, trains, and certifies industry personnel. FERC regulates the interstate transmission of electricity, natural gas, and oil. EPAct-05 gave FERC additional responsibilities that include protecting the reliability of the high-voltage interstate transmission system through mandatory reliability standards. The Western Electricity Coordinating Council (WECC) is the regional entity responsible for overseeing implementation of mandatory system reliability standards approved by NERC and FERC under authority specified in the EPAct-05.

WECC reliability requirements for transmission corridors can conflict with the Garamendi Principles, especially the use of existing ROWs. Although FERC has not established regulatory requirements for separation distance between parallel transmission lines, the WECC's performance requirements for multiple transmission lines (circuits) in one corridor are more stringent than those required by NERC. This issue is increasingly important because of the public's desire to place new transmission lines in existing corridors and limit new transmission corridors.

The Southwest Area Transmission Common Corridor Task Force addresses concerns regarding the effect of WECC's more stringent criteria on the use of transmission corridors in a May 2009 white paper. The white paper discusses the tension between the reliability benefits of increasing the separation of circuits in a common corridor versus the increased cost of the extra land needed and the creation of additional land use conflicts and environmental impacts.

The additional requirements could also result in reduction in path ratings and make projects in corridors with existing lines, or proposed double-circuit projects in new corridors, uneconomical.

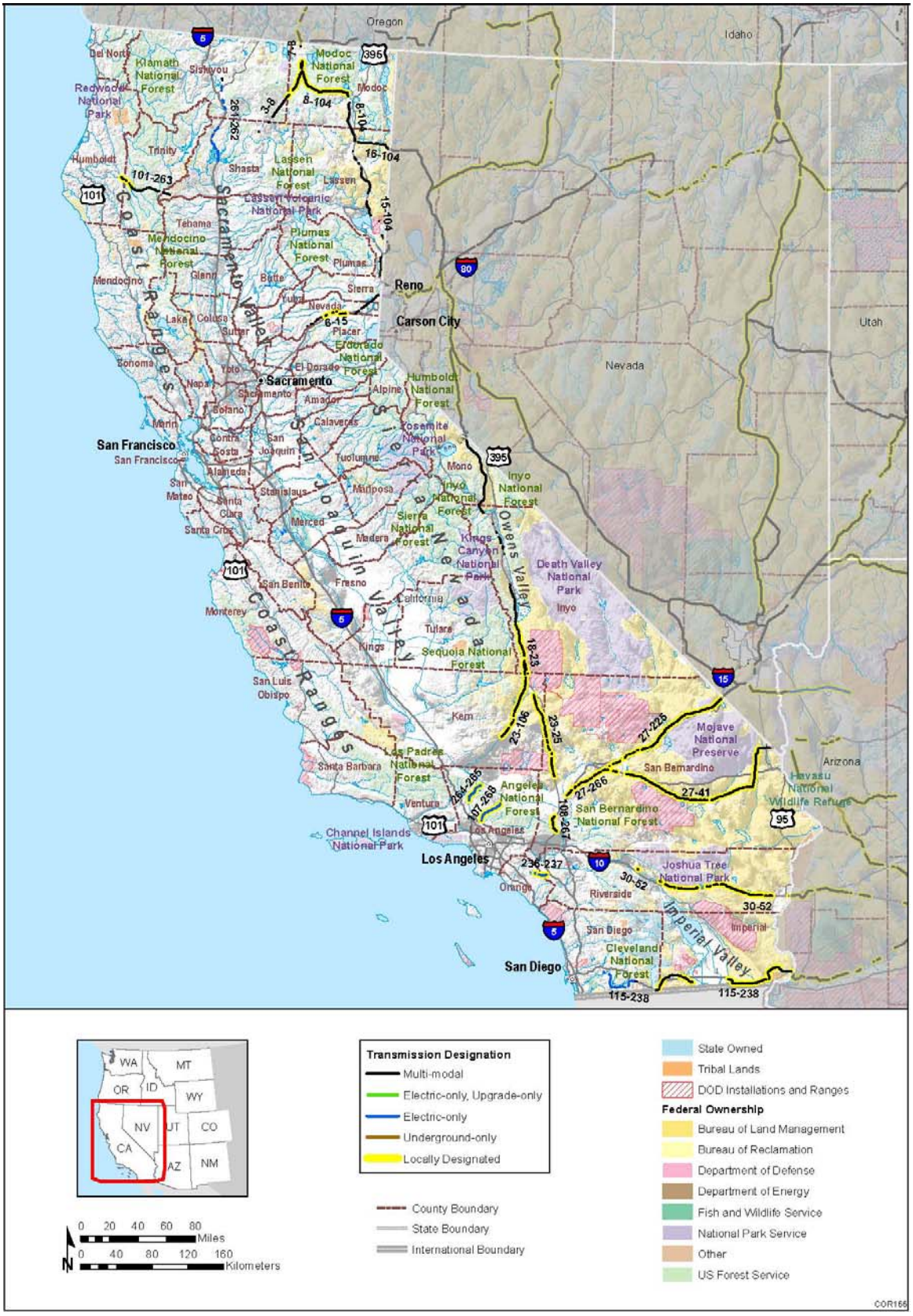
Given the conflict between placing transmission lines in common corridors and WECC reliability criteria, the 2009 Strategic Transmission Investment Plan recommends that the Energy Commission staff work with FERC and WECC regarding reliability criteria and the separation of adjacent transmission lines in a corridor.

Transmission Corridor Designation

Section 368 of the Energy Policy Act of 2005 required the federal government to designate energy transport corridors on federal lands that would foster future projects to deliver electricity, oil, natural gas, and hydrogen to markets and users in the 11 western states. The corridors were to take into account the need for upgraded and new electricity transmission and distribution facilities to improve reliability, relieve congestion, and enhance the capability of the national grid to deliver electricity. Figure 3.2 shows federal transmission line corridors in California.

Similarly, SB 1059 (Escutia and Morrow, Chapter 638, Statutes of 2006) authorizes the Energy Commission to designate transmission corridor zones on non-federal lands to make them available in the future for high-voltage transmission projects. A transmission corridor zone can be proposed by any person or entity, including the Energy Commission, planning to build an electric transmission line in the state. Through this process, the Energy Commission works closely with state and local agencies and the public to determine if it should designate corridors in the state for future use.

Figure 3.2: Proposed Section 368 Energy Corridor Rights-of-Way in California
http://corridoreis.anl.gov/eis/fmap/rowsbm/index.cfm



Source: California Energy Commission

Chapter 4: Expected New Renewable Energy Infrastructure Developments

This chapter identifies what and where new generation and transmission development is likely to occur over the next 20 years. Since future infrastructure is being studied by various groups, the study processes and results are described. Locations and descriptions of proposed generation and transmission infrastructure are provided, although these reflect only a point in time, and new legislation, policy, and study may result in changes.

Development of Renewable Generation to Meet a 33 Percent Renewables Portfolio Standard (RPS)

The CPUC undertook a study in 2009 to determine the cost, risk, and timing to meet a 33 percent RPS. The analysis looked at four renewable resource cases, each representing a different strategy to reach the 33 percent RPS. The four cases included:

- A 33 percent reference case (using California's current renewable procurement path and dependent on new technologies).
- A high wind case.
- A high out-of-state delivered case (relying on new, long multi-state transmission).
- A high distributed generation case (assumes a high amount of smaller-scale, renewable generation).

To provide reference points, the study developed a 20 percent RPS case, an all-gas scenario, and a 2008 costs scenario. The key findings of the *33% Renewables Portfolio Standard Implementation Analysis Preliminary Results* are:

- The 2020 timeline for achieving a 33 percent RPS is ambitious given the infrastructure requirements.
- To meet a 20 percent RPS by 2020, four new transmission projects would be needed, three of which have undergone environmental review. To meet a 33 percent RPS by 2020, seven additional new transmission lines would be required along with a nearly tripling of renewable energy production compared with the 20 percent RPS.
- Electricity is estimated to be more expensive in 2020 regardless of RPS requirements. However, a 33 percent RPS would result in an estimated 7.1 percent higher total statewide electricity expenditure, compared with a 20 percent RPS and a 10.2 percent higher expenditure compared with an all-gas scenario.
- Achieving a 33 percent RPS would require tradeoffs among policies and objectives. The state may want to adopt strategies such as planning for more transmission and generation than needed to reach 33 percent RPS; procuring generation that is not dependent on large scale transmission, such as distributed solar PV; and concentrating renewable development on pre-permitted land.

Development of Remote Renewables

A number of state and federal agencies, nonprofits and other stakeholders are studying the viability and permitting support required to deliver large-scale renewable energy to distant load centers. The following initiatives affect the location and timing of renewable energy development.

California's Renewable Energy Transmission Initiative (RETI)

RETI is a stakeholder collaborative process organized to develop a plan for expanding the electric transmission grid to provide access and connections to renewable energy resource areas. All RETI activities are undertaken at the direction of the 30-member Stakeholder Steering Committee (SSC). The SSC is composed of representatives of environmental groups; renewable developers; public and investor-owned utilities; state, federal, and local governments; Native American tribes; and consumers.

The RETI work is organized into three phases:

- **Phase 1**: Identification, characterization and ranking of Competitive Renewable Energy Zones (CREZ) specified for solar, wind, geothermal, or biomass energy facilities in California and neighboring states.
- **Phase 2**: Development of a statewide conceptual transmission plan to access priority CREZ, based on more detailed analysis of CREZ.
- **Phase 3**: Development of detailed plans of service for priority components of the statewide transmission plan.

This discussion of RETI focuses on the potential locations of renewable energy. The transmission lines that would likely access the renewable energy projects are discussed in Chapter 4.

The *Phase 1A Final Report* and *Phase 1B Final Report* were published in April 2008 and January 2009, respectively. The *Phase 1A Final Report* defines the renewable resource assessment method, details study assumptions, and identifies renewable resources to be considered in the project-level analysis. It includes an overview of each renewable technology used in the RETI model and evaluates the availability of the resource for each technology. Potential renewable energy projects comprise CREZs, based on geographical proximity, development time frame, shared transmission constraints, and economic benefits. The report ranks the CREZs based on cost-effectiveness, environmental concerns, development and scheduling certainty, and other factors to provide a renewable resource base case for California.

To rank the environmental concerns for each of the CREZs, the RETI Environmental Working Group (EWG) produced an environmental screen (criteria) identifying circumstances where renewable development would be prohibited or restricted by law or policy. The RETI EWG environmental screen identified Category 1 Lands, where development would be precluded, and Category 2 Lands as areas

with significant restrictions, but no outright prohibitions. Examples of Category 1 Lands include federal and state wilderness areas, federal and state parks, and lands precluded from development under habitat conservation plans and natural community conservation plans. No development occurs on Category 1 lands shown below, although transmission lines and access roads may be allowed under certain circumstances.

- Designated Federal Wilderness Areas
- Wilderness Study Areas
- California State Wilderness areas
- Units of National Park System (national parks, national monuments, national recreation areas, national historic sites, national preserves)
- Inventoried Road-less areas on USFS national forests
- National Historic and National Scenic Trails
- National Wild, Scenic and Recreational Rivers
- USFWS National Wildlife Refuges
- California State parks
- DFG Wildlife Areas and Ecological Reserves
- Certain BLM Conservation Areas, Private Preserves of the Wildlands Conservancy (conservation areas owned and managed by TWC for public benefit and use; development is precluded)
- BLM National Recreation areas,
- BLM National Monuments
- Existing Conservation Mitigation banks under conservation easement approved by the state Department of Fish and Game, U.S. Fish and Wildlife Service or Army Corps of Engineers
- California state defined wetlands

Examples of Category 2 Lands include BLM Areas of Critical Environmental Concern and USFWS designated critical habitat for federally listed endangered and threatened species. Resource conservation lands purchased by private funds and donated to BLM and lands specified in Proposed Wilderness Bills (S. 493 and H.R. 3682), as of May 1, 2008, were also included as Category 2 Lands. Development on the Category 2 lands described below is assumed to be limited in the absence of site-specific information to the contrary.

- BLM Areas of Critical Environmental Concern
- USFWS designated Critical Habitat for federally listed endangered and threatened species
- Special wildlife management areas in the West Mojave Resources Management Plan. Desert Wildlife Management Areas and Mohave Ground Squirrel Conservation Areas.
- Lands purchased by private funds and donated to BLM, specifically the California Desert Acquisition Project by the Wildlands Conservancy

- "Proposed and Potential Conservation Reserves" in Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs)
- Land specified as of May 1, 2008, in Proposed Wilderness Bills (S. 493, H.R. 3682) and not otherwise protected)

The *Phase 2A Final Report* was published in September of 2009. The report re-ranks the CREZs preliminarily described in Phase 1 and provides a statewide conceptual transmission expansion plan to access the CREZs. The report recommends which potential transmission projects should be considered priorities for future study. RETI also addresses where renewable energy facilities could be built. Use of undisturbed land has been controversial. The RETI stakeholders recommend that the California Department of Conservation expand and expedite its efforts to define, identify, and map vacant and disturbed lands throughout California, focusing first on counties that RETI has identified as having large renewable energy and transmission development potential. Then an action plan should be developed to consolidate disturbed or degraded lands so that renewable energy development can occur quickly.

The Phase 2B Draft Report was published in April 2010. The Phase 2B report documents key changes made in the economic model, technology assumptions, competitive renewable energy zones, and out of- state (OOS) resources. The report considered these changes and updates the economic analysis of the CREZ.

Local Government Involvement in RETI

The RETI Phase 2A report recommended that entities planning new transmission lines engage local governments to identify and assess potential alternatives, including other transmission alternatives and non-transmission alternatives, early in the planning process. The RETI Stakeholder Steering Committee was designed to represent key interests including local governments such as counties that are affected by planned generation-transmission development. Additionally, a number of counties and the Regional Council of Rural Counties commented on the RETI reports incorporating local concerns into the transmission planning process. During the RETI process, a number of cities, such as Redding, requested public meetings to give the public and stakeholders an opportunity to learn about the purpose, goals, and work of the RETI process.

Changes were made to the economic model and key technology assumptions that affect the economic analysis. Several changes were made to the cost of generation calculator to improve its accuracy and flexibility and to incorporate expanded tax credits.

Changes were also made with respect to CREZs. The overall California CREZ capacity increased by about 3,000 MW compared to Phase 2A. This is primarily due to the addition of the new Westlands

CREZ and the expansion of the Owens Valley CREZ.

California Transmission Planning Group

The CTPG is developing a statewide transmission plan (2010 CTPG Study for 2020) to determine the transmission system improvements that are needed to support the state's 33 percent RPS and maintain the transmission system reliability. The CTPG is using the RETI conceptual plan as a starting point.

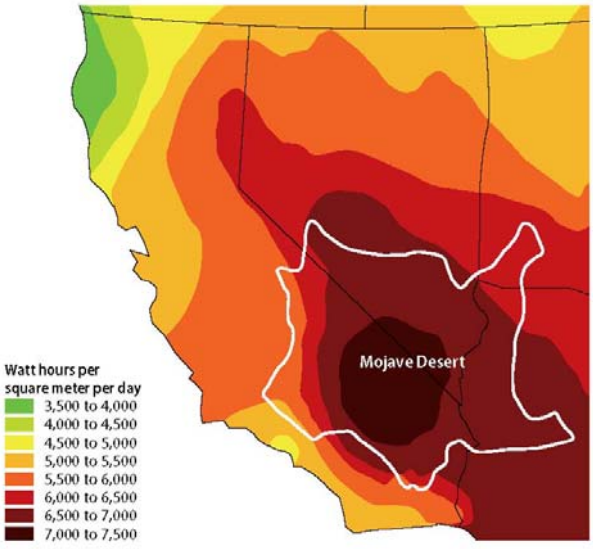
The study is being conducted in four phases. The Phase 1 Final Report was posted February 17, 2010. In this phase of modeling, load-serving entities supplying the majority of California retail loads provided renewable procurement scenarios reflecting the current status of renewable generation. In Phase 2, future scenarios included a heavy generation of renewable in-state as well renewable energy imported from either the northwest or southwest. The results of the Phase 2 modeling were released May 7, 2010. Alternative transmission scenarios are also being modeled in Phase 3. Those transmission improvements that are needed under a variety of scenarios will comprise a "least regrets" element of the final transmission plan. The Final Phase 3 Study Report was released September 2010. Phase 4 will continue to evaluate Northern California and out-of-state resource scenarios. A Draft Phase 4 report is expected November 2010. A final 2010 statewide plan will be released late December 2010.

Desert Renewable Energy Conservation Plan

Because many of the renewable projects are proposed for remote desert regions (due to strong solar intensity, relatively flat land and few homes – see Figure 4.1), Governor Schwarzenegger's Executive Order S-14-08 requires the Renewable Energy Action Team (REAT) to establish a Desert Renewable Energy Conservation Plan (DRECP) for the California Mojave and Colorado Desert regions. The REAT (Energy Commission, CDFG, BLM, and USFWS) is identifying areas suitable for renewable energy project development and areas that would contribute to the conservation of sensitive species and natural communities. The final DRECP is expected in June 2012.

Figure 4.1: Remote Desert Regions

Source: California State Auditor 2008



Development of the DRECP will provide an opportunity for local government input. The REAT team held meetings in 2009 with county supervisors and planning staff in the six California desert counties to obtain local agency input on the plan. The REAT released a Revised Draft of *The Best Management Practices & Guidance Manual: Desert Renewable Energy Projects* in October 2009 and a final version in September 2010. Adoption by the Energy Commission is expected in early 2011. The manual provides recommendations to renewable energy developers, and federal, state, local, and Tribal governments for improving the efficiency of the regulatory process in California and protecting environmental and cultural resources, that is, buildings and artifacts, and human health and safety.

The REAT intends for the DRECP to be developed in a manner that anticipates and accommodates future participation of local governments and will explore with them the feasibility of integrating existing Natural Community Conservation Plans, Habitat Conservation Plans, and other relevant plans. CDFG, as a member of REAT, attends meetings with local partners and agencies to help incorporate the agreements between the CDFG and local governments into the DRECP. Additionally, the DRECP planning process provides for public review and comment, and the Energy Commission, in collaboration with the other parties, conducts regular workshops to provide an opportunity for public participation and input.

The REAT released draft maps in March 2010 identifying areas in the desert to study for development and conservation. A stakeholder meeting was held in Riverside to discuss the REAT maps and to describe the purpose, organization, planning goals, and preliminary conservation objectives of the DRECP. In April 2010, independent scientists, selected for their expertise in the fields of biology, botany, and desert ecology, met to advise the REAT on biological issues and questions critical to preparing the DRECP. A public review draft of their recommendations was released in August 2010.

In May 2010, the REAT agencies signed a planning agreement designed to: define goals and commitments; define geographic scope of the planning area; identify preliminary list of species; identify preliminary conservation objectives; establish a process for inclusion of independent scientific input; ensure coordination among wildlife agencies, Energy Commission, and BLM; establish an interim process for project proposals while the DRECP is being developed; and ensure public participation and outreach.

A Stakeholder Advisory Group was established, and a DRECP Work Plan was released on June 15, 2010, for review and comment. The results of the Independent Science Advisors were presented in August 2010 and Stakeholder meetings continue monthly. Numerous documents relating to the DRECP can be accessed at www.DRECP.org.

Western Governors' Association Western Renewable Energy Zones (WREZ)

The Western Governors' Association (WGA) is an independent, nonprofit organization representing the governors of 19 states and three U.S. Flag islands in the Pacific.

In May 2008, the WGA embarked on the WREZ initiative to identify renewable energy zones within the Western Interconnection and facilitate the development of high-voltage transmission systems to those areas with the potential for abundant renewable resources and low or easily mitigated environmental impacts. (The Western Interconnection is the electricity grid that includes the states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; part of Texas near El Paso; the Canadian provinces of Alberta and British Columbia; and a small portion of northern Mexico in Baja California.)

Guiding the initiative is the WREZ Steering Committee, composed of governors, premiers, and public utility commissioners. Officials from the Department of Energy, Departments of the Interior and Agriculture, and Federal Energy Regulatory Commission participate as ex-officio members. Because the WREZ Initiative emphasizes stakeholder involvement, public outreach, and transparency, participating stakeholders have included: public service commissioners; state, local, and provincial officials; load-serving entities; transmission owners; renewable energy developers; environmental organizations; Native American tribes; federal land use agencies; and other interested individuals and organizations.

Beginning with detailed mapping of renewable energy resources, compiled by the National Renewable Energy Laboratory, the WREZ Zone Identification and Technical Analysis working group screened the data for the most concentrated and highest value energy resource areas. These candidate study areas were then screened further for regulatory and physical limitations and reduced to a smaller number of qualified resource areas, which were used to identify potential renewable energy zones.

Similar to the RETI process, the WREZ established the Environment and Lands (E&L) working group to categorize the resource potential of the zones, based on land use, wildlife, and other environmental considerations. This group developed a list of "exclusion" or "avoidance" areas. (These categories do not apply to transmission infrastructure at this time.) "Exclusion" lands were areas where development is precluded by federal, state, or local statute or regulation and by certain resources areas (wetlands/water bodies, surface mines, urban areas, military land [except for airspace and operational areas], and excessively sloped areas). "Avoidance" lands were areas that have been extended some degree of special protection because of established purpose, policy, or restrictions but are not absolutely precluded from future development. The *Environment & Lands Working Group – Phase 1 Report*

gives more details regarding the criteria used.

In June 2009, the Western governors adopted the WREZ *Phase 1 Report*. This report focuses on identifying the concentrated, high-quality renewable energy supplies necessary to meet demand in the Western Interconnection markets. It contains the WREZ Initiative Hub Map which identifies the WREZ's area-specific "hubs" and provides graphical representations of regional utility-scale renewable resource potential. These hubs will provide a basis for evaluation of interstate transmission lines in future WREZ phases. The hubs represent energy generation potential far greater than currently required to meet Western Interconnection RPS. Additionally the overall economic resource potential of renewable energy is significantly larger than policy scenarios identified to date. The West can therefore consider what types and locations of resource development would be most productive, rather than having insufficient options to meet requirements and goals.

Since the publication of the Phase I Report, WGA has focused on determining which of the high-quality areas are of greatest interest to electric service providers; determining how their renewable resources can best be developed; and planning for a transmission network that will bring those resources to market. Using $26.5 million of federal stimulus funds awarded in December 2009, WGA and its affiliate, the Western Interstate Energy Board, are continuing activities initiated under the WREZ project and developing alternative energy futures that can be modeled into transmission plans that will open up high-quality renewable resource areas.

The WGA WREZ effort may identify generation and transmission opportunities in other states or principalities that would benefit California. If California prefers to procure more resources locally, as would be consistent with RETI, conflict among jurisdictions seeking to export energy and in-state development interests may emerge. (See sidebar.)

BLM Renewable Energy Zones

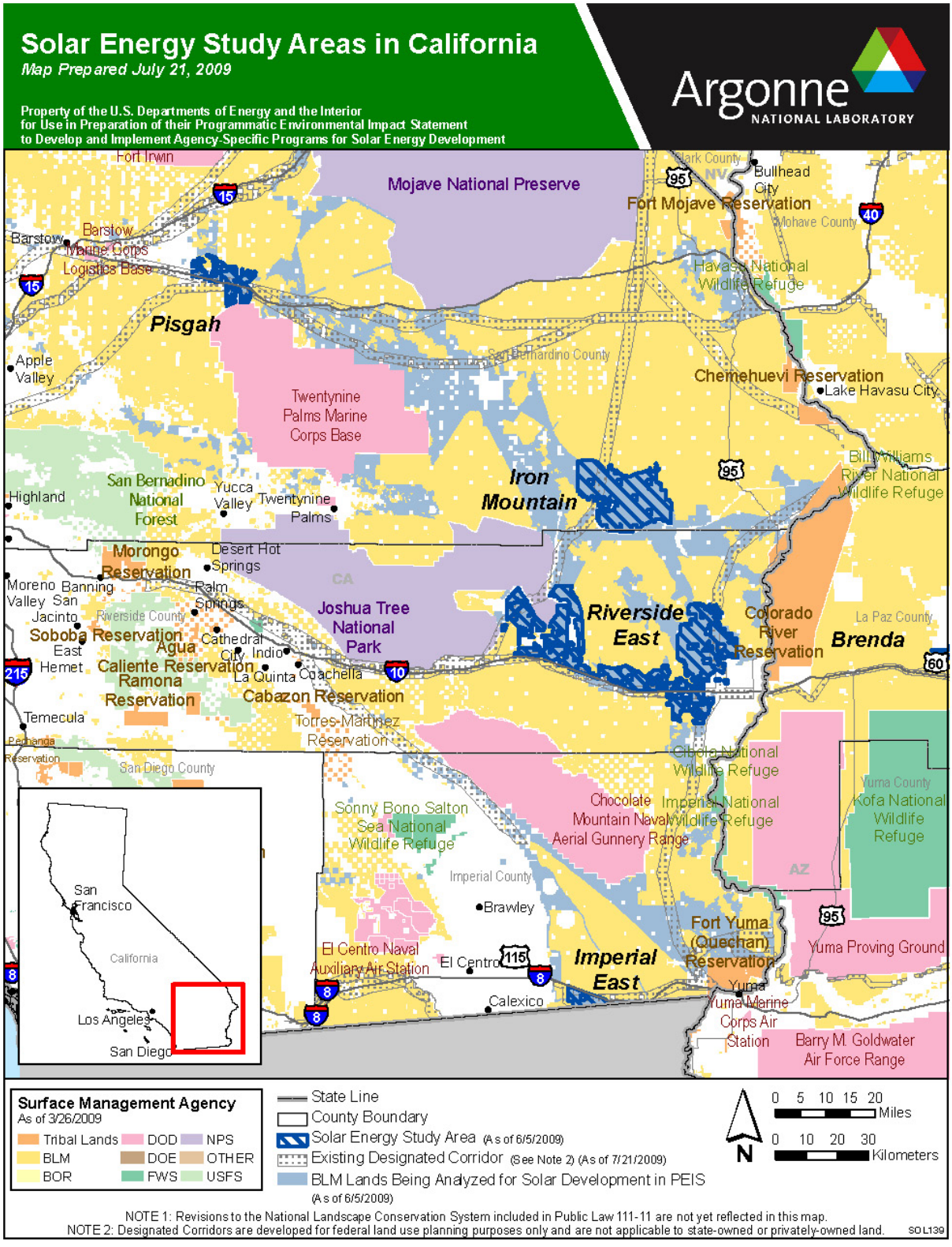
One of the President's goals in implementing the American Recovery and Reinvestment Act of 2009 (ARRA) is supporting the renewable energy industry and providing capital over the next three years to eventually double domestic renewable energy capacity.

The BLM intends to expedite the processing and permitting of environmentally responsible renewable energy development on BLM-administered multi-use public lands. BLM will spend $41 million to facilitate a rapid and responsible move to large-scale production of solar, wind, and geothermal energy.

DOE and the BLM are preparing a draft Solar Programmatic Environmental Impact Statement (PEIS) to evaluate utility-scale solar energy development in six Western states: Arizona, California, Colorado, Nevada, New Mexico, and Utah. A Wind Energy PEIS was published in December 2005. The Geothermal PEIS was published on December 17, 2008.

The BLM received ARRA funding to enhance the solar PEIS through an in-depth study of 24 specific tracts on public lands with excellent solar development potential and limited resource conflicts. Criteria used to identify the study areas include: a minimum size of 2,000 acres, close proximity to existing roads and existing or designated transmission line routes, and a slope of less than 5 percent. Sensitive resource areas were also removed from consideration. The BLM and DOE are conducting environmental analysis to determine if the areas should be designated as Solar Energy Zones (See Figure 4.2.) and to complete the studies and data collection necessary to address the siting of projects and energy transmission capabilities.

Figure 4.2: Solar Energy Zones in California



Source: U.S. Department of Energy

Beyond 2010, the BLM plans to address alternative leasing systems, funding methods, and larger-scale renewable energy production and transmission. In June 2010, BLM released a rental schedule for solar energy right-of-way authorizations on the public lands. The solar rental schedule includes a "Base Rent" for the acreage of public land included within the right-of-way authorization and a capacity fee based on the MW-size of the project.

Remote Renewable Projects Currently Under Review

A number of renewable projects are currently under environmental review on BLM-managed, state-owned, and private land in California. Table 4.1 lists some of the remote renewable energy projects under environmental review by the BLM, Energy Commission, and counties as of November 2010. Many more renewable projects are proposed to be developed; the Energy Commission identifies 279 renewable energy projects on its website.

Some small-scale projects have also been proposed, primarily on private land, as distributed generation, close to energy load centers. (See following discussion.)

Not all of the projects listed in Table 4.1 or on the Energy Commission's website will complete the environmental review, nor is it likely that all projects will be funded and constructed. However, the list is indicative of the large and varied number and type of remote renewable projects being considered in California. Additionally, Table 4.1 shows what counties are currently proposed for remote renewable projects.

Development of Smaller Scale Renewable Generation Closer to Distribution Lines

Distributed generation is one of the resource options for California. Distributed generation resources are grid-connected or stand-alone electrical generation or storage systems, connected to the distribution level of the grid, and located at or very near where the energy is used. Because the generation is located near the areas served, the need for new transmission and distribution infrastructure and transmission line losses is reduced.

In-State Versus Out-of-State Development of Renewable Resources

Debate continues on whether it is better for California to import renewable energy generated out-of-state or to prioritize building renewable energy facilities on California land. The Center for Energy Efficiency and Renewable Technology published the report *Harvesting California's Renewable Energy Resources: A Green Job Business Plan* in February 2009. It compiled results from a series of studies that conclude that California could add hundreds of thousands of jobs throughout the state through an increase in use of renewable energy. The report concludes the following:

- Building renewable power plants and infrastructure required to meet a 33 percent RPS by 2020 could result in the investment of up to $60 billion in the state's economy.
- Achieving a 33 percent RPS by 2020 would likely create between 100,000 and 235,000 new jobs (manufacturing, operations, and maintenance).

The report further states that new renewable energy projects generate more jobs than equivalent investments in fossil fuels. Large scale solar projects have local and statewide economic developmental benefits because long-term fuel costs associated with conventional electricity generation (for example, natural gas) are replaced with operations and maintenance costs (for example, labor) scale renewable power-related salaries. However, Section 73 of the California Revenue and Taxation Code allows property tax exclusion for certain types of solar energy systems installed between January 1, 1999, and December 31, 2016. This loss of tax revenue may dampen the local economic developmental benefits of renewable energy projects.

The *2007 IEPR* recommended expanding and upgrading California's transmission distribution system to prepare for the resource mix needed to reach GHG emission reduction goals. With the state's policies to rely increasingly on preferred sources, the local distribution system must also be able to integrate and efficiently use generated power. Distributed generation may be enhanced through the development of a "smart grid." (See sidebar.)

California programs that support the customer side of the meter (from the distribution line to the home or business) include the California Solar Initiative, Self-Generation Incentive Program, New Solar Homes Partnership Program, and Emerging Renewables Program. The Emerging Renewable Program offers cash rebates on eligible grid-connected small wind and fuel cell renewable energy.

Table 4.1: Examples of Remote Renewable Projects Under Review or Permitted*

Project Name	Location	Status
Solar		
Ivanpah Solar Energy Generating System (400 MW solar thermal)	San Bernardino County	Approved
Beacon Solar Energy Project (250 MW solar thermal)	Kern County	Approved
Imperial Valley Solar (formerly Stirling Solar Two) (750 MW solar thermal)	Imperial County	Approved
City of Palmdale Hybrid Gas-Solar (555 MW natural gas, 62 MW solar thermal)	Los Angeles County	Staff Assessment Published
Calico Solar (formerly Stirling Solar One) (850 MW solar thermal)	San Bernardino County	Approved
Abengoa Mojave Solar Project (250 MW solar thermal)	San Bernardino County	Approved
Solar Millennium Palen Solar Power Project (484 MW solar thermal)	Riverside County	Staff Assessment and Draft EIS published
Solar Millennium Blythe Solar Power Project (1,000 MW solar thermal)	Riverside County	Approved
Genesis Solar Energy Project (250 MW solar thermal)	Riverside County	Approved
Solar Millennium Ridgecrest Solar Power Project (250 MW solar thermal)	Kern County	Staff Assessment and Draft EIS published
Rice Solar Energy Project (150 MW solar thermal)	Riverside County	Staff Assessment and Draft EIS published
NRG Alpine Solar Project (92 MW PV)	Los Angeles County	Under environmental review
Panoche Solar Valley Farm (420 MW solar PV)	San Benito County	Final EIR published
Blythe Airport Solar 1 Project (100 MW solar PV)	Riverside County	MND published
NRG Solar Blythe (21 MW solar PV)	Riverside County	Operational
California Valley Solar Ranch (250 MW solar PV)	San Luis Obispo County	Draft EIR published
Lucerne Valley Solar Project (62 MW solar PV)	San Bernardino County	Final EIS published
Loma Farm PV (50 MW)	Imperial County	Under environmental review
First Solar, Topaz Solar Farm (550 MW solar PV)	San Luis Obispo County	Draft EIR published
Antelope Valley Solar Ranch One (230 MW solar PV)	Los Angeles County	Approved
SGS Rosamond Solar Project (155 MW solar PV)	Kern County	Approved
Maricopa Sun Solar Complex Project (700 MW solar PV)	Kern County	Under environmental review
Willow Springs Solar Array (160 MW solar PV)	Kern County	Under environmental review
Monte Vista Solar Array (126 MW solar PV)	Kern County	Under environmental review
Antelope Valley Solar Project (650 MW solar PV)	Kern County	Under environmental review
Wind		
Bear River Ridge (50-75 MW)	Humboldt County	EIR/EIS published
Granite Mountain Wind Energy Project (73 MW)	San Bernardino County	Draft EIS/EIR published
West Fry Wind Energy Project	San Bernardino County	Under environmental review
Alta-Oak Creek Mojave Project (up to 800 MW)	Kern County	Draft EIR published
Manzana Wind Project (246 MW)	Kern County	Approved
Shiloh III (200 MW)	Solano County	Final EIR published
Lompoc Wind Energy Project	Santa Barbara County	Approved
Pacific Wind (Iberdrola) (200 MW)	San Diego County	Under environmental review
TelStar Energies, LLC (300 MW)	Imperial County	Under environmental review
Geothermal		
West Chocolate Mountain (21,300 acres)	Imperial County, CA	Under environmental review
Hudson Ranch (49 MW)	Imperial County, CA	Under construction
Black Rock (159 MW)	Imperial County, CA	Under environmental review

**** The full list of renewable projects proposed to be built in California as of November 2010 can be found at the Energy Commission website: http://www.energy.ca.gov/33by2020/documents/index.html. It should be noted that this list is likely to change and be updated periodically. Additional projects were identified from Kern County's website:*** **http://www.co.kern.ca.us/planning/pdfs/renewable/solar_projects.pdf**

Many more renewable facilities in the 3-20 MW range are being proposed near load centers. For example, Aerojet and Solar Power, Inc., are adding 2.4 MW to a 3.6 MW photovoltaic solar project currently under construction at the Aerojet facility near Sacramento. At 6 MW, the site will be one of the largest single-site solar industrial locations in California. SMUD is also a key partner in the project.

In February 2009, PG&E announced plans to develop 500 MW of solar PV projects over the next 5 years. The company stated that it would largely focus on projects from 1 to 20 MW, with ground-mounted systems rather than rooftop panels playing a substantial role. Since 2008, SCE has installed more than 3 MW of rooftop PV on over 1 million square-foot commercial roofs, using thin film PV technology. The installations are part of a planned project of 3.5 million large-scale PV panels that would generate 250 MW of energy annually.

Development of Rooftop Solar Systems

In January 2007, the Energy Commission and CPUC launched Go Solar California (GSC), a one-stop shop for information on rebates, tax credits, and incentives for solar energy systems in California. It also includes two new solar incentive programs, with slightly modified program requirements compared to the older programs. The Energy Commission provides incentives to energy-efficient new home construction under the New Solar Homes Partnership. All other facilities in investor-owned utility territories receive

Smart Grid

A smart grid delivers electricity from suppliers to consumers using digital technology. The CPUC defines a smart grid as an electric grid that is enhanced through the use of digital communication technologies and allows customers, utilities, and society to make better choices in how energy is produced, delivered, and consumed. In practical terms, the smart grid can include an Advanced Metering Infrastructure (AMI) (including home area networks of smart appliances), dynamic pricing (pricing that changes in response to grid and supply conditions), energy efficiency mechanisms (home displays), distributed generation, energy storage, and networked plug-in vehicles.

The CPUC has initiated a rulemaking (R.08.-12-009) to consider policies for California investor-owned electric utilities to develop a smarter electric grid in the state. The proceeding will consider setting policies, standards, and protocols to guide the development of a smart grid system and promote integration of new technologies such as distributed generation, storage, demand-side technologies, and electric vehicles.

The ARRA allocates $4.5 billion to the Department of Energy's Office of Electricity Delivery and Energy Reliability. These "smart grid" funds are to be used to demonstrate smart grid technologies, develop a nationwide plan to modernize the electric grid, enhance security of U.S. energy infrastructure, and ensure reliable electricity delivery to meet growing demand. Title XIII of the Federal Energy Act of 2007 and SB 17 both require the State to define California's smart grid by July 2010 and are described in Chapter 3.

rebates from the CPUC-administered program, the California Solar Initiative (CSI). The CSI is part of the Go Solar California campaign and builds on 10 years of state solar rebates offered to customers in PG&E, SCE, and SDG&E territories. The CPUC developed the program rules for the California Solar Initiative through a public rulemaking process. Approximately 211 MW were installed under the CSI between 2007 and March 2009. The largest increase in MWs occurred in PG&E territory, with more than 30,000 PV systems installed. The top counties to install energy in PG&E territory as of 2009 were:

- Santa Clara County (42 MW)
- Alameda County (18.6 MW)
- Fresno County (18.1 MW)
- Contra Costa County (17.4 MW)

The top counties to install energy in SCE territory were:

- Los Angeles County (45.3 MW)
- San Bernardino County (22.8 MW)
- Riverside County (22.7 MW)
- Orange County (15.4 MW)

San Diego County has installed 46.6 MW of energy under the CSI.

There has been much debate over the role of rooftop solar systems in achieving the RPS goals. The RETI Discussion Draft Paper *California's Renewable Energy Goals – Assessing the Need for Additional Transmission Facilities* addresses the likelihood that sufficient distributed solar PV would be developed to remove the need for utility-scale renewable development and associated transmission. This paper identified factors likely to influence the pace of large scale deployment of distributed solar PV: subsidies, feed-in tariffs, manufacturing and installation cost, and manufacturing scale-up.

- **Subsidies**. PV installations have been subsidized by a variety of programs. The GSC program (See above.) is projected to add approximately 3,000 MW of grid-connected PV capacity by the time the subsidies are eliminated in 2016. The assumption underlying the program is that the subsidies will increase installations and manufacturing experience, which will lower costs to make PV generation competitive with other sources of electricity. In 2008, Congress extended the 30 percent federal solar investment tax credit for eight years and made it available to utilities, allowing utility company ownership of relatively large-scale urban PV installations. The GSC program is extremely ambitious and should support continued rapid growth of PV deployment in California. But if the federal investment tax credit is not extended beyond 2016, and if California PV subsidies decline through 2016 and are absent thereafter, it may be difficult for PV installations to meet current targets.
- **Feed-In Tariffs.** Feed-in tariffs are fixed long-term prices for renewable energy and are intended to promote lower cost development of renewable resources. In California, the CPUC has approved

feed-in-tariffs for installations up to 1 MW and is actively considering an expanded program. In its *2008 IEPR Update*, the Energy Commission recommended that the CPUC implement a system of feed-in tariffs for projects up to 20 MW. In the *2009 IEPR*, it was recommended that expanded action be taken. To help reduce the environmental impacts of achieving 33 percent renewable electricity by 2020, the Energy Commission recommended that the Legislature consider requiring utilities or the California ISO to offer technology-specific (or product-specific) feed-in tariffs designed to effectively spur development and integration of 20 MW and smaller renewable energy projects in low-impact competitive renewable energy zones and along renewable-rich transmission corridors. In October, 2009 Governor Schwarzenegger signed Senate Bill 32 (McLeod, Chapter 328, Statutes of 2009), which raises the project size cap from 1.5 MW to 3 MW and increases the statewide cap from 500 MW to 750 MW and expands the program to include municipal utilities.

- **Manufacturing and Installation Cost.** The cost of PV installations is expected to continue to decline. "Thin film" PV collectors are less expensive to manufacture than conventional crystalline silicon modules. Given sufficient sales volume, economies of scale in manufacturing could reduce the cost of PV installation and energy generated, perhaps to levels comparable to current energy prices. PV installed in residential new construction is significantly less expensive relative to retrofit installations. Widespread expansion of distributed PV beyond current programs, however, would require a large number of retrofit installations. Although the cost of individual PV components should continue to fall, relying heavily on PV would significantly increase the total cost of meeting the state's renewable energy and greenhouse gas (GHG) targets.
- **Manufacturing Scale-Up.** Shipments of "thin film" PV collectors totaled approximately 500 MW globally in 2008. While PV manufacturing plants are expected to develop quickly, the availability of financing and raw material supply would need to increase proportionally to match an increased demand. Because the worldwide demand for PV is expected to continue to increase along with demand throughout the United States, the competition for supplies may affect the cost and schedule for increasing the use of distributed solar PV.

Development of New Transmission

The *RETI Phase 2A Report* and the *2009 Strategic Transmission Investment Plan* describe the actions California must take to plan and permit a cost-effective, reliable electric transmission system that would help achieve policy goals such as reducing GHGs and meeting RPS requirements. Both

documents analyze and make recommendations for prioritizing the development of certain transmission projects. The April 2010 *RETI Phase 2B Report* modifies the Phase 2A Report slightly, based on the inclusion of the expanded investment tax credit made available through the ARRA and substantial cost reductions in solar photovoltaic technology.

RETI Foundation, Delivery, and Connector Lines

The RETI Stakeholder Steering Committee (SSC) formed a Conceptual Transmission Planning Work Group to develop a statewide conceptual transmission expansion plan. RETI Phase 2 work focused on alternative transmission line connections for accessing Competitive Renewable Energy Zone (CREZ) energy supplies.

The initial plan presented in the RETI Phase 2A report represents the consensus recommendation on major upgrades to the California grid. It then grouped the line segments into three categories of facilities: Renewable Foundation lines, Renewable Delivery lines, and Renewable Collector lines (See Figure 4.3). The categories are defined by RETI as follows:

- **Renewable Foundation Lines** would increase the capacity of the California transmission network between Palm Springs and Sacramento, allowing energy to flow north or south as needed. There are 14 key line segments in the Foundation Group. Although these lines would deliver renewable energy from any CREZ to consumers throughout the state, they also would be important for meeting growing energy demand regardless of generation source.
- **Renewable Delivery Lines** would move energy from Foundation lines to major load centers. The increased capacity provided by the lines of this group is also likely to be needed to meet growing energy demand regardless of generation source. There are 13 major line segments in the Renewable Delivery Group.
- **Renewable Collector Lines** would carry power from CREZ to Foundation and Delivery lines. These line segments are grouped geographically into projects capable of accessing adjacent CREZ. There are 12 groupings of collector lines. Several of these lines form portions of or connect to major intertie lines connecting California to the western regional grid and therefore provide access to out-of-state energy resources.

Given the amount of renewable energy required to meet state goals in 2020, new transmission lines are likely to be required. Some lines may be needed to meet growing energy demand regardless of generation source.

The RETI stakeholders encouraged entities planning new transmission lines to engage local governments, environmentalists, and other interested parties in a collaborative process to identify and assess potential alternatives, including other transmission alternatives, non-transmission alternatives, and alternative routes for the proposed line, early in their planning processes. Public outreach to agencies and stakeholders that

would participate in a corridor designation proceeding is a key step in preserving and protecting transmission access to areas where renewable energy development is likely to take place.

Uncertainties exist about how much new generation will be needed, where and when it will be developed, and where load growth will be concentrated. The RETI Renewable Foundation lines and Renewable Delivery lines serve multiple purposes and would likely be needed under any eventuality. These lines are considered "no-regrets" or "least-regrets" infrastructure. Development of transmission lines recommended through the RETI process will be phased to allow for flexibility if conditions change. The RETI process is continuing into 2010 with a primary purpose of refining and prioritizing the transmission lines identified in the Phase 2A report. As noted previously, the CTPG Phase 3 Study Report will identify and further evaluate "least regret" transmission lines.

Transmission Lines Identified in the Strategic Transmission Investment Plan (STIP)

The Energy Commission's *2009 STIP* emphasizes the need for coordinated and effective statewide transmission planning and an effective way to resolve land use conflicts that emerge when permitting transmission lines. It identifies the next planning need as a short-term, 10-year transmission plan that focuses on the transmission infrastructure necessary to meet California's renewable goals. The STIP plan used the *RETI Phase 2A Final Report* as a data source for prioritizing transmission projects.

The STIP plan recommends that transmission planning and permitting efforts at the California ISO, the California Transmission Planning Group, and Energy Commission be focused as follows:

The first priority is those projects supported by the Energy Commission in the 2005 and 2007 Strategic Plans because they provide statewide benefits. These include:

- Imperial Irrigation District (IID) Upgrades
- SCE Tehachapi Upgrades (Segment 1 – Antelope-Pardee; Segment 2 – Antelope-Vincent; Segment 3 – Antelope-Tehachapi; and Segments 4-11 – Tehachapi Renewable Transmission Project)
- SCE Devers – Palo Verde 2 (the entire California-Arizona interconnection, as well as the California-only variation)
- LADWP Tehachapi Upgrade (Barren Ridge Renewable Transmission Project)
- PG&E Central California Clean Energy Transmission Project (C3ETP)
- SDG&E Sunrise Powerlink Transmission Project
- Lake Elsinore Advanced Pumped Storage (LEAPS) Project – Transmission Portion
- Green Path North Coordinated Projects[2]

2 The LADWP cancelled plans for Green Path North in March 2010.

Figure 4.3: Foundation Lines, Delivery Lines and Renewable Collector Lines

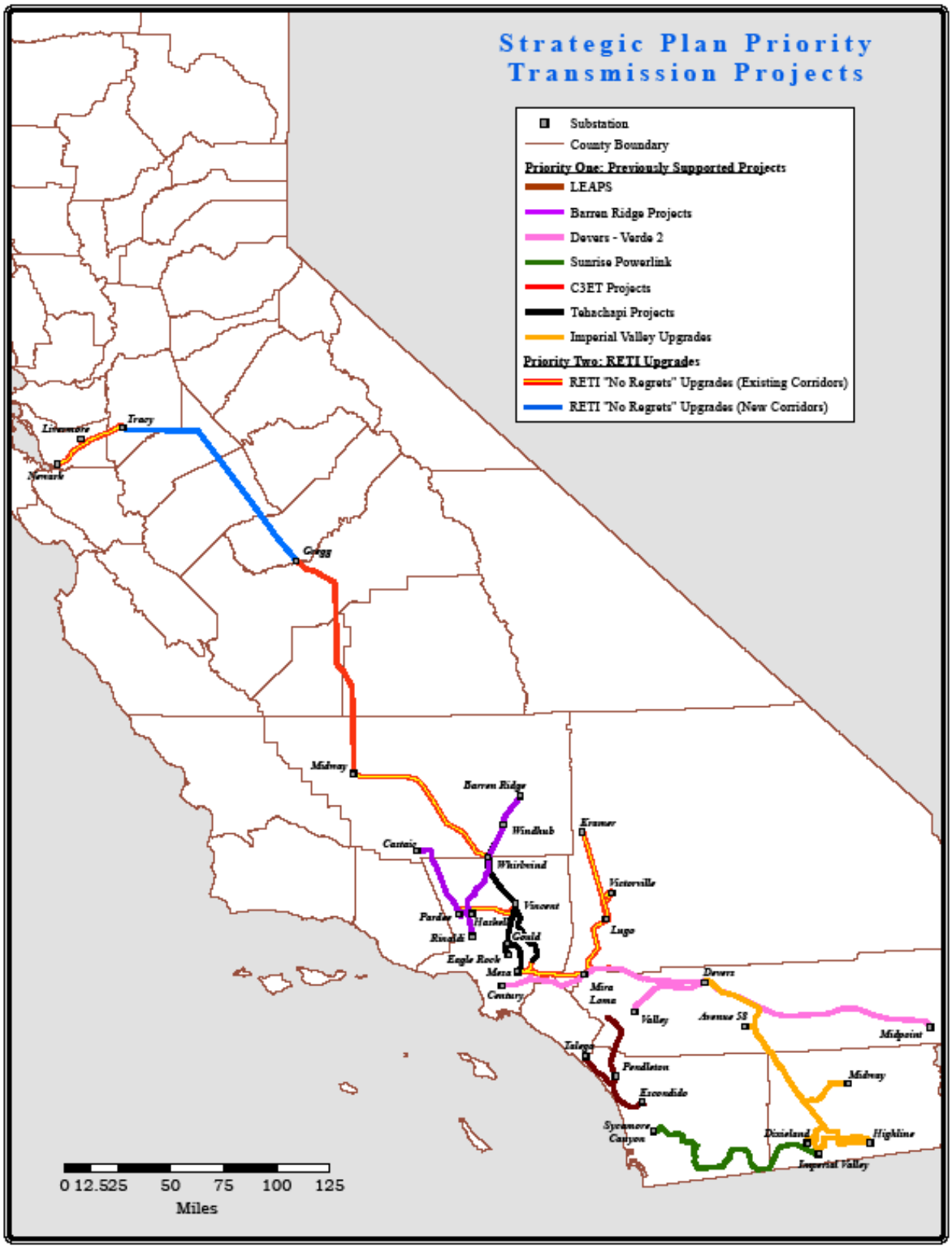
Source: California Energy Commission

The second priority should be RETI "no regrets" line segments that do not require new corridors, plus two additional lines (Gregg – Alpha Four and Tracy – Alpha Four) that do not meet these criteria but are necessary to link to Northern California load centers:

- Kramer – Lugo 500 kV
- Lugo – Victorville #2 500 kV
- Devers – Mira Loma #1 and #2 500 kV
- Gregg – Alpha Four 500 kV
- Tracy – Alpha Four 500 kV 1 & 2:
- Devers – Valley #3 500 kV
- Tesla – Newark 230 kV
- Tracy – Livermore 230 kV

The third priority is to begin outreach for the RETI segments described above that require new corridors and to develop phased solutions to interconnect specific renewable zones as generators commit to developing projects. Figure 4.4 illustrates these lines.

Figure 4.4: California's Priority Transmission Projects



Source: California Energy Commission

Chapter 5: Permitting Steps and Timelines for Generation and Transmission Facilities

Introduction

Detailed processes are in place to permit new electricity infrastructure. Which agency takes the lead in processing an application depends on the nature of the project and its location. The type of environmental review is based on the level of anticipated impact and whether both state and federal environmental reviews are required. This chapter discusses the general permitting processes for energy infrastructure, including land use approvals and environmental review. The role and participation of local governments in permitting of energy infrastructure are identified throughout this chapter.

Land Use Approvals

The California Constitution, various state statutes, and case law give local governments authority to regulate development as an exercise of the protection of the welfare, security, health, and safety of its citizens. The most common use of police power, as it relates to the planning and permitting process, is exercised through adoption and enforcement of local land use and building regulations, including zoning codes and other enactments needed to secure the welfare of a community. The scope of this power is quite broad, so long as it does not conflict with laws of the state or federal government. Where conflicts arise, the local enactment will often be preempted, depending on the legal circumstances. Characteristics of a project, including the facility type, size, location, and type of project applicant, all help identify if the project is under a local agency's authority.

In terms of electric generating facilities, there are two types that trigger preemption of local authority regardless of the project applicant.

First, the licensing of thermal power plants 50 MW or greater and their related facilities including transmission lines are normally under the authority of the Energy Commission. The Energy Commission must review projects within its jurisdiction for compliance with local laws, ordinances, regulations, and standards (LORS). Although the Energy Commission has exclusive authority to certify sites and related facilities (PRC §§ 25500 *et al*), it encourages local agencies to participate in its licensing process and strives to maintain consistency with local LORS. The two processes that are currently available are the 12-18 month review (application for certification - AFC) and the small power plant exemption (SPPE). The SPPE is available for projects between 50 MW and 100 MW, provided the proposed project does not create an unmitigated significant impact on environmental resources.

Secondly, non-federal hydroelectric facilities (those not built by the federal government) are normally under the licensing authority of the Federal Energy Regulatory Commission (FERC). Exemptions from FERC's license are granted only if projects meet specific

criteria. Exempted hydroelectric projects are subject to state environmental review.

Most local government land use plans do not include large-scale renewable energy facilities as an approved land use. A developer may have to apply for an amendment to the city or county general plan. If a city or county zoning ordinance does not allow the building of a large-scale renewable energy facility, the developer must file an application to rezone the land. In addition to rezoning, if the land is under Williamson Act contract for long term agricultural use, the contract may need to be terminated if the contracted land uses do not allow energy development. Termination by the local government and land owners involves lengthy timeframes. Local funds are lost and agricultural production is reduced.

For land that is already zoned for a broad purpose (for example, industrial use) and specifically identifies energy production, the developer may need to apply for a conditional use permit (CUP) from the city or county.

Federal land, such as BLM land in the Mojave Desert, is subject to federal land use decisions. Resource management plans define the allowable resource uses of the land and the use of the land for solar energy production is not currently approved. Therefore, in addition to a right-of-way (ROW) lease, a plan amendment is needed to allow such a use.

Environmental Review Process

A major element of permitting for new infrastructure is an environmental review. For projects within California, CEQA identifies the environmental review process and requirements. An initial study serves as a preliminary analysis to determine whether an environmental impact report (EIR) or a negative declaration (ND) must be prepared or to identify the significant environmental effects to be analyzed in an EIR. Typically, an EIR, or equivalent document, is prepared for electricity infrastructure projects unless the project is very small (for example, a 1 MW solar PV project). In that case, a ND or mitigated negative declaration (MND) may be prepared instead. These terms are defined in the accompanying sidebar.

For projects requiring federal action, including, but not limited to, federal construction projects, plans to manage and/or develop federally owned lands, and federal approval of non-federal activities, such as grants, licenses, and permits, NEPA identifies the environmental review process and requirements. An environmental impact statement (EIS) is the parallel document to the EIR. An environmental assessment (EA) is the NEPA document parallel to a CEQA Initial Study. A Finding of No Significant Impact (FONSI) is equivalent to a CEQA ND.

For projects requiring both state and federal actions, a joint CEQA/NEPA document is generally recommended. For example, solar thermal power plants of 50 MWs or larger require certification (licensing) by the Energy Commission and must be reviewed under CEQA. As many of these projects are proposed on federal lands, NEPA review is also required. These combined documents

must meet the review and public involvement requirements of both processes.

The requirements of CEQA and NEPA differ slightly in scope, timing, and degree of analysis of certain issues. A discussion of environmental review processes for new energy infrastructure is presented later in this chapter, including a table comparing CEQA and NEPA requirements.

State agencies follow CEQA, with a specified time frame of 12 months for completion of the process. In addition to the 12 months, many agencies typically allow for a data adequacy period, which California's Permit Streamlining Act limits to 30 days. Also, a three-month extension can be granted under the Permit Streamlining Act with the applicant's consent.

While agencies strive to meet streamlined time frames, the complexity and controversy of projects can often extend the review period. A 2008 California State Auditor Report indicates that the average time for obtaining Energy Commission approval to build a power plant was 22 months and the time to permit a transmission line was 18 months. In general, NEPA does not set a time limit for completion of environmental assessments (EA) or an EIS.

The environmental review process includes discovery and analysis; the decision-making process follows the analysis and may include hearings. These terms are used to characterize the activities at each stage of the process and are not necessarily used by all agencies. For example, not all agencies have a formal data adequacy stage as does the Energy Commission, prior to the start of the environmental review process. However, most permitting processes have a "prefiling" or application period, which provides an opportunity for applicants, lead agencies, and responsible agencies to review the application, request additional information, and identify potential concerns.

Types of Environmental Analysis Prepared by State and Local Agencies under the California Environmental Quality Act

Environmental Impact Report: A detailed written document prepared under CEQA describing and analyzing the significant environmental effects of a project and discussing ways to avoid or reduce the effects.

Negative Declaration: A written document briefly describing the reasons that a proposed project not exempt from CEQA will not have a significant effect on the environment and therefore does not require the preparation of an environmental impact report.

Mitigated Negative Declaration: A negative declaration that can be prepared when the initial study has identified potentially significant environmental effects, but changes to the project before the proposed negative declaration and initial study are released would reduce those effects to the point where there is clearly no significant effect on the environment.

Source: California Code of Regulations, Title 14

When dealing with the Energy Commission, CPUC, FERC, and other state and federal agencies, the greatest opportunity for local governments to become involved occurs during the discovery process. State and federal agencies actively solicit information and direction from local agencies to ensure compliance with LORS and compatibility with the affected communities. Public meetings and informational hearings offer additional opportunities for local agencies, and the general public, to offer input. The type of information that can be submitted and actions that can be taken may be limited once the hearings begin.

A more in-depth review of the environmental process currently underway for renewable energy projects is provided later in this chapter. The timeline and process for designating transmission corridors are also provided as is the general environmental review process undertaken by the CPUC for transmission line projects.

The upfront identification of best management practices (BMPs) can limit the need for extensive mitigation measures. As discussed in Chapter 3, the REAT agencies (i.e., the Energy Commission, CDFG, BLM, and USFWS) have prepared a *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects* to assist in the development of effective mitigation measures for California desert projects. The manual provides recommendations to help renewable energy developers, and federal, state, local and Tribal governments, navigate the complex permitting and approval process for renewable energy projects.

Determining the Lead Agency

Determining the lead agency for CEQA or NEPA purposes when more than one agency has jurisdiction is not always easy. As discussed above, some agencies have clear preemptive authority over specific energy projects, giving them lead agency status for environmental review purposes. This section attempts to shed some light on the issue of lead agency status for environmental review of electricity infrastructure projects, including power plants, transmission lines, and pipelines.

There are some general guidelines that can be followed to determine which agency (ies) will likely have primary authority over a given energy project. For example:

- Local governments are the lead agency for wind, and solar PV plants, and for thermal plants 50 MW or less, and generally for geothermal wells, resource conveyance lines, and other equipment related to geothermal field development, and biofuel refineries, digester, or biogas facilities.
- The Energy Commission is the state lead agency for thermal power plants 50 MW or greater and their related facilities.
- The CPUC is the state lead agency for investor-owned utility energy projects such as transmission lines, natural gas storage fields, and pipeline projects.
- Municipal utilities are normally the lead agency for their own non-thermal or thermal power plants under 50 MW, intrastate transmission lines, or pipeline projects. Tribal governments are the lead decision makers for power plant

and transmission lines projects proposed on their lands.

- The FERC Office of Hydro-power Licensing is normally the NEPA lead agency for on non-federal, (for example, projects not built by the federal government) nonexempt hydroelectric projects.
- FERC is generally the NEPA lead agency for interstate electrical transmission and natural gas pipeline projects. These projects may also have a CEQA component for facilities located in California.

These are not absolutes by any means. Even within each of these rather certain conditions, there are exceptions. This is particularly applicable when a project involves significant amounts of public lands or resources under the jurisdiction of a state or federal agency. Under those circumstances, the agency with ownership or control may act as the lead agency for environmental review purposes. For instance, if a proposed interstate transmission line facility crosses substantial federal lands under the management of the U.S. Forest Service, the Forest Service may be the lead agency rather than FERC.

In situations where both NEPA and CEQA apply to a project, joint environmental analysis and documentation is frequently done. This currently is the case for large solar thermal projects on BLM land within California. A joint staff assessment/ draft environmental impact statement (SA/DEIS) is prepared by both the Energy Commission and BLM. Each agency will publish its final document separately; however, a revised staff assessment by the Energy Commission and a final EIS by BLM.

However, a joint document is not required. In cases where no such arrangement has been made and separate analysis is being conducted, agencies are encouraged to avoid redundancy. According to the CEQA guidelines, if the NEPA process is completed first, the lead agency for the CEQA analysis should rely, whenever possible, on the NEPA documents instead of redoing the work. When the CEQA analysis is started first, the state or local lead agency is encouraged to initiate early consultation and work closely with the federal lead agency.

Identifying Secondary or Responsible Agencies

Secondary agencies are those that have some permitting or approval requirement over a project but are not the lead agency. Both CEQA and NEPA identify secondary agencies. CEQA defines these agencies as "responsible" agencies, with responsibility for carrying out or approving some part of a project in addition to the duties of the lead agency. Over the years, the relationship between a "responsible agency" and the "lead" agency has been described in both statutes and case law. Important aspects of this relationship include:

- Lead agencies must consult with responsible agencies prior to the completion of an EIR.
- Responsible agencies will comment only on aspects of the project for which they have jurisdictional authority or expertise. The lead agency is required to

respond to these comments before certifying the final EIR.

- A responsible agency is limited in the scope of environmental analysis it can prepare beyond that produced by the lead agency for a given project.

In cases of licensing programs that have been found to be functional equivalents to CEQA EIR processes, these principles hold true, although the processes may vary slightly. Table 5.1 identifies agencies that may be considered secondary or responsible agencies for energy projects including power plants, transmission lines, storage facilities, and natural gas or oil pipelines. Under NEPA, the lead agency may request that any other federal agency which has jurisdiction by law or which has special expertise with respect to any environmental issue which should be addressed in the EIS be a cooperating agency. Additionally, a federal, state or local agency may request that the lead agency designate it as a cooperating agency.

Each cooperating agency would participate in the NEPA process at the earliest possible time, including the scoping process and assume responsibility for developing information and preparing portions of the EIS at the request of the lead agency for which it has special expertise. NEPA requires coordination with other agencies and tribes to ensure that other environmental regulations are satisfied. Therefore, lead agencies often coordinate with USFWS on the Endangered Species Act, EPA on the Clean Water Act and Clean Air Act, and with State Historic Preservation Officers on the National Historic Preservation Act.

Tables 5.2 through 5.5 provide general permitting matrices for renewable energy projects under different agency jurisdiction. Because the USFWS and CDFG play a major role in the CEQA/NEPA process and its timing, they are included in these tables, along with the Energy Commission, the CPUC, local government, and BLM.

Ensuring Permit Compliance – Mitigation Planning and Monitoring

CEQA gives decision makers an opportunity to avoid or substantially reduce potentially significant adverse environmental effects by requiring impact mitigation measures. However, researchers have often found that mitigation measures are not implemented or either the mitigation or its implementation was inadequate. In an attempt to correct this deficiency, the California Legislature enacted PRC § 21081.6 in 1988.

The statute states that the approving entity (whether the lead agency or a responsible agency) must adopt a reporting or monitoring program that is designed to ensure compliance during project implementation. The law applies to all adopted mitigation measures included as part of a certified EIR or MND. The statute allows for substantial local flexibility in devising an appropriate mitigation monitoring program, but the mitigation measures must have a nexus to the impact, be feasible and enforceable and the monitoring program must be implemented

for the life of the project or until all mitigation requirements have been met.

As a result, local agencies have generally viewed the statute as requiring both programmatic and project-specific implementation procedures. Some agencies have first developed overall implementation programs by ordinance or resolution and then applied those programs to individual projects on a case-by-case basis. The commonalities of these programs are shown in the sidebar "CEQA Monitoring Requirements."

Table 5.1: Additional Agencies with Permit, Leasing, or Review Requirements

Agency	Permit/Review	Legal Authority
FEDERAL		
Bureau of Indian Affairs	Right-of-Way Grants	Title 25, United States Code sections 323-328
U.S. Fish and Wildlife Service	Biological Assessment Biological Opinion Jeopardy Opinion	Fish and Wildlife Coordination Act Endangered Species Act Federal Power Act Migratory Bird Treaty Act Eagle Protection Act
U.S. Army Corps of Engineers	404 Permit/Jurisdictional Determination	Clean Water Act
USDA Forest Service	Special Use Permit Project-specific Plan Amendment (if not designated for the use)	36 CFR 251
National Park Service	Right-of-Way Permit (for transmission lines)	Title 16, United States Code section 79
US Environmental Protection Agency	Adequacy of NEPA review Prevention of Significant Determination	Section 309, Clean Air Act Section 112, Clean Air Act
Bureau of Reclamation	Hydropower License Application Overhead Crossing Permit Lease of Power Privilege	Federal Power Act Reclamation Act
CALIFORNIA		
State Lands Commission	Land Use Lease (tidelands, submerged lands, beds of navigable rivers, school & other state lands) Geothermal Exploration or prospecting leasing (oil, gas & other minerals)	Public Resources Code section 6000 et seq.
Department of Fish & Game	Approval Stream or Lake Alteration Permit Dredging Permit Endangered Species Take Permit	CA Endangered Species Act, Fish & Game Code section 2090 Fish and Game Code section 1600-7 5650-53.9, 11037
Department of Transportation	Encroachment Permit	Facilities that impact state highways
Department of Conservation, Div. of Oil, Gas & Geothermal Resources	Notice of Intention Oil, Gas, or Geothermal Well Permit	Title 14. California Code of Regulations. Div 2
Department of Water Resources, Div. of Safety of Dams	Plan Approval	Water Code, Div. 3, Part 1 & 2
Department of Resources Recycling and Recovery	Solid Waste Facility Permit	Government Code sections 66796.32 Public Resources Code section 40000 et seq.
Department of Toxic Substances Control	Permit to Operate	Health & Safety Code, Div. 20, Ch. 6.5

Agency	Permit/Review	Legal Authority
Coastal Commission	Development Permit Consistency with Local Coastal Plan	CA Coastal Act 1976, Public Resources Code section 30000 et seq.
Department of Forestry & Fire Protection	Timber Operations License Timber Harvesting Plan Timberland Conversion Permit Fire Permit	Public Resources Code section 4511 et seq., 4521 et seq. Public Resources Code section 4100 et seq.
Department of Parks & Recreation	Right-of-Way Permit	Public Resources Code section 5012
State Water Resources Control	Certification of Adequacy of Water Rights Permit to Appropriate Water Statement of Diversion and Use NPDES permit Clean Water Act Section 401 Certification	Public Utilities Code section 2821 Water Code, Div. 1 & 2
Reclamation Board	Encroachment Permit	Water Code section 8590 et seq.
OTHER AGENCIES		
Local Agencies	-General Plan Compliance -Specific Plan Compliance -Zoning Code/Ordinance Compliance -Coastal Development Permit (if in Coastal Zone) & Coastal Consistency Determination -Local Coastal Plan/Program Compliance (if in Coastal Zone) -Encroachment Permit -Building Permit -Subdivision Map Act Compliance -Williamson Act Compliance -Airport Land Use Plan -Any other special plans or standards specific to a jurisdiction	Varying and depending on jurisdiction
Air Districts	Preliminary/Final Determination of Compliance Permits to Construct/Operate	Warren-Alquist Act Clean Air Act
California ISO	LGIA/SGIA	FERC Order No. 2003-C

Source: Aspen Environmental Group

Table 5.2: Permitting Matrix: Projects < 50 MW on Private Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar PV	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar Thermal	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Biofuels - Generation	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Geothermal	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Fossil Fuel	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*

Source: Department of Fish and Game, 2009

Table 5.3: Permitting Matrix: Projects > 50 MW on Private Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	LGIA	
Solar PV	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	LGIA	
Solar Thermal	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit
Biofuels - Generation	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit
Geothermal	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit
Fossil Fuel	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*

Source: Department of Fish and Game, 2009

CEC	*California Energy Commission*	*CUP*	*Conditional Use Permit*
CPUC	*California Public Utilities Commission*	*FESA*	*Federal Endangered Species Act*
LOCAL	*Local Government*	*CESA ITP*	*California Endangered Species Act Incidental Take Permit*
BLM	*Bureau of Land Management*		
USFWS	*United States Fish and Wildlife Service*	*NCCP/LSAA*	*Natural Communities Conservation Planning/Lake and Streambed Alteration Agreement*
CDFG	*California Department of Fish and Game*		
CEQA	*California Environmental Quality Act*	*LGIA*	*Large Generator Interconnection Agreement*
PPA	*Power Purchase Agreement*	*SGIA*	*Small Generator Interconnection Agreement*

Table 5.4: Permitting Matrix: Projects < 50 MW on Public Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar PV	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar Thermal	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Biofuels - Generation	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Geothermal	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Fossil Fuel	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*

Source: Department of Fish and Game, 2009

Table 5.5: Permitting Matrix: Projects > 50 MW on Public Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/ CESA ITP or NCCP/LSAA	LGIA	
Solar PV	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/ CESA ITP or NCCP/LSAA	LGIA	
Solar Thermal	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit
Biofuels - Generation	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit
Geothermal	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit
Fossil Fuel	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*

Source: Department of Fish and Game, 2009

CEC *California Energy Commission*
CPUC *California Public Utilities Commission*
LOCAL *Local Government*
BLM *Bureau of Land Management*
USFWS *United States Fish and Wildlife Service*
CDFG *California Department of Fish and Game*
CEQA *California Environmental Quality Act*
PPA *Power Purchase Agreement*
CUP *Conditional Use Permit*
FESA *Federal Endangered Species Act*
CESA ITP *California Endangered Species Act Incidental Take Permit*
NCCP/LSAA *Natural Communities Conservation Planning/Lake and Streambed Alteration Agreement*
LGIA *Large Generator Interconnection Agreement*
SGIA *Small Generator Interconnection Agreement*

Elements of a Successful Mitigation Monitoring Program

The basic elements of a successful mitigation monitoring program include:

- Well-written conditions specifying the required actions, timing, and methods for satisfactory implementation of the mitigation measures.
- Specific reporting procedures and monitoring requirements for the project developer/operator and the responsible monitoring agency. This includes identification of those parties responsible for completion and/or verification of the required actions.
- Established methods or protocols and qualified monitors to verify compliance.

Well-Written Conditions. It is essential that conditions be "SMARTE," that is, specific, measurable, agreed upon, realistic, time certain, and enforceable. Without these elements and a follow-up program, success cannot be guaranteed, determined or measured. Vaguely worded mitigation requirements result in poor implementation and disappointing results.

Reporting and Monitoring. It is also important to identify the parties responsible for implementation of the mitigation measures, verification, and reporting. This is usually the project proponent and/or operator but may also be the lead or responsible agency or their subcontractor/consultant. Ultimately, however, it is the responsibility of the lead agency to ensure that the mitigation program is followed and the mitigations are adequately implemented. Clear, concise mitigation measures with specific implementation requirements, including reporting schedules and milestones, make it easier for all parties to comply with the project requirements. Site visits complement compliance report submittals.

Environmental Expertise. The expertise and involvement of the responsible agency (for example, CDFG, or the local air district) are an essential part of a successful mitigation monitoring program. Environmental expertise provides the means to ensure that implementation of the mitigation measures is adequate and timely. Qualifications for those monitoring mitigation activities or verifying information should be specified as part of

SMARTE Principles for Mitigation Measures

Specific: Provide clear direction so that all parties understand what, and in some cases how, mitigation or other required activities need to be done.

Measurable: Provide an objective for measuring (determining) whether a condition has been met.

Agreed Upon: Strive for agreement with the project owner, other agencies, and interested parties on the condition requirements.

Realistic: Strive for the simplest, most direct, and least-costly condition requirements that will achieve the required or desired goal.

Time Framed: Provide clear realistic time frames for compliance with each condition.

Enforceable: Provide a practical method for verifying that the required activities have been done in the specified time frames.

the mitigation monitoring program. Monitoring of site activity can be accomplished using periodic reports from the developer and onsite inspections. If the responsible monitoring staff does not possess the necessary environmental expertise to evaluate the submitted reports or oversee fieldwork, the agency should hire consultants and include consultant charges in its fee structure.

Environmental Review Processes for New Energy Infrastructure

This section discusses the environmental permitting processes for energy infrastructure, including power plant siting, transmission corridors, and transmission line siting.

Energy Commission Power Plant Siting Process

The "siting process" is a chain of events leading to a decision by the five-member Energy Commission to approve or to disapprove construction of a thermal power plant with a capacity of at least 50 MW, and related facilities such as transmission and water lines. At the Energy Commission, the siting process is used to evaluate the proposed power plant project – the location, design and construction as well as the impact on public health, safety, the environment, and the general welfare.

The Energy Commission's siting process has the following characteristics:

- It is a certified regulatory program that is functionally equivalent to a review under CEQA.

CEQA Monitoring Requirements

Typical Implementing Ordinance Provisions of a Monitoring Program

- State purpose of and need for the program.
- Designate a monitoring program manager.
- Assign responsibilities to various departments within the agency (for example, planning or public works).
- Develop cooperative agreements with other agencies.
- Identify the project applicant's role.
- Establish an equitable fee structure to cover monitoring expenses.
- Establish enforcement procedures and penalties. Create conflict resolution and appeal provisions.
- Design reporting forms.
- Specify the review process for reporting monitoring results.
- Provide for quarterly and/or annual monitoring reports that summarize the results of the program and allow feedback to staff and decision makers.

Program Application on Specific Projects

- Require greater specificity in mitigation measures, such as to include measurable performance standards.
- Prepare a master mitigation checklist for each project.
- Assign project-specific monitoring responsibilities to agency staff or other entity for each category of mitigation measure.
- Develop a project-specific monitoring schedule for each mitigation measure category.
- Establish specific reporting requirements, including both agency monitoring reports and applicant field verification reports.

- The Energy Commission staff is an independent, objective party to the proceeding.
- Intervenors are granted formal participation and have specific responsibilities in the siting case.
- A committee of the Commission hears evidence, the Presiding Member of the Committee puts forth a Proposed Decision, and the full Commission approves or rejects the application.
- Ex parte communication is prohibited between any party and an Energy Commission decision maker.
- A Public Adviser provides independent advice on ways to participate in the regulatory process.
- Agencies may intervene in a siting case and, although not eligible for reimbursement of such expenses, they may still be reimbursed for the costs of complying with Energy Commission requests for comments and recommendations.

The Energy Commission has two distinct review processes – the 6-month Small Power Plant Exemption (SPPE) process and the 12-month Application for Certification (AFC) process. Most of the renewable power plant projects under review by the Energy Commission are in the latter category, and thus this guide provides a detailed discussion of the AFC process. However, a short description of the SPPE application process is provided here.

The Energy Commission may exempt thermal power plants with a generating capacity of up to 100 megawatts and modifications to existing generating facilities that do not add capacity in excess of 100 megawatts, if the Commission finds that no substantial adverse impact on the environment or energy resources will result from the construction or operation of the proposed facility or from the modifications. When an applicant seeks an SPPE, the staff prepares an initial study. The document follows CEQA guidelines and for each issue determines the significance of the project's impacts. The initial study also suggests conditions necessary for the exemption to assure there are no significant effects on the environment.

The Energy Commission serves as the lead agency under CEQA for any SPPE. Hearings may be held prior to the committee's proposed decision. After the Energy Commission approves an SPPE, the Energy Commission's analytical documents are also used by responsible local agencies that subsequently issue permits for the project. The Energy Commission staff or local agencies monitor compliance of any conditions of exemption that are required to ensure that impacts are fully mitigated.

If there are no significant adverse impacts on the environment, the Committee prepares a proposed negative declaration (ND) or mitigated negative declaration (MND). The public is noticed regarding the document’s availability. A 30-day comment period is established for the proposed ND or MND. At the conclusion of the comment period, if significant revisions are needed, the document may be re-published and re-

issued following the same process as the original initial study.

The 12-month AFC siting process identified below is relevant to any type of thermal power plant. Some additional information has been included that is specific to solar power plants when located on federal land. Solar projects proposed on federal land managed by the BLM must comply with both the Energy Commission siting process and the BLM NEPA review process. A detailed description of the Energy Commission siting process and role of public participation can be found at *Public Participation in the Siting Process: Practice and Procedure Guide*. Similarly, the BLM publishes a NEPA handbook, the *BLM National Environmental Policy Act Handbook H-1790-1 that* discusses the NEPA review process in detail.

The AFC siting process consists of six phases, followed by a compliance process, if a license is granted. A typical timeline for a 12-month AFC review process is shown as Figure 5.1.

Pre-Filing Phase

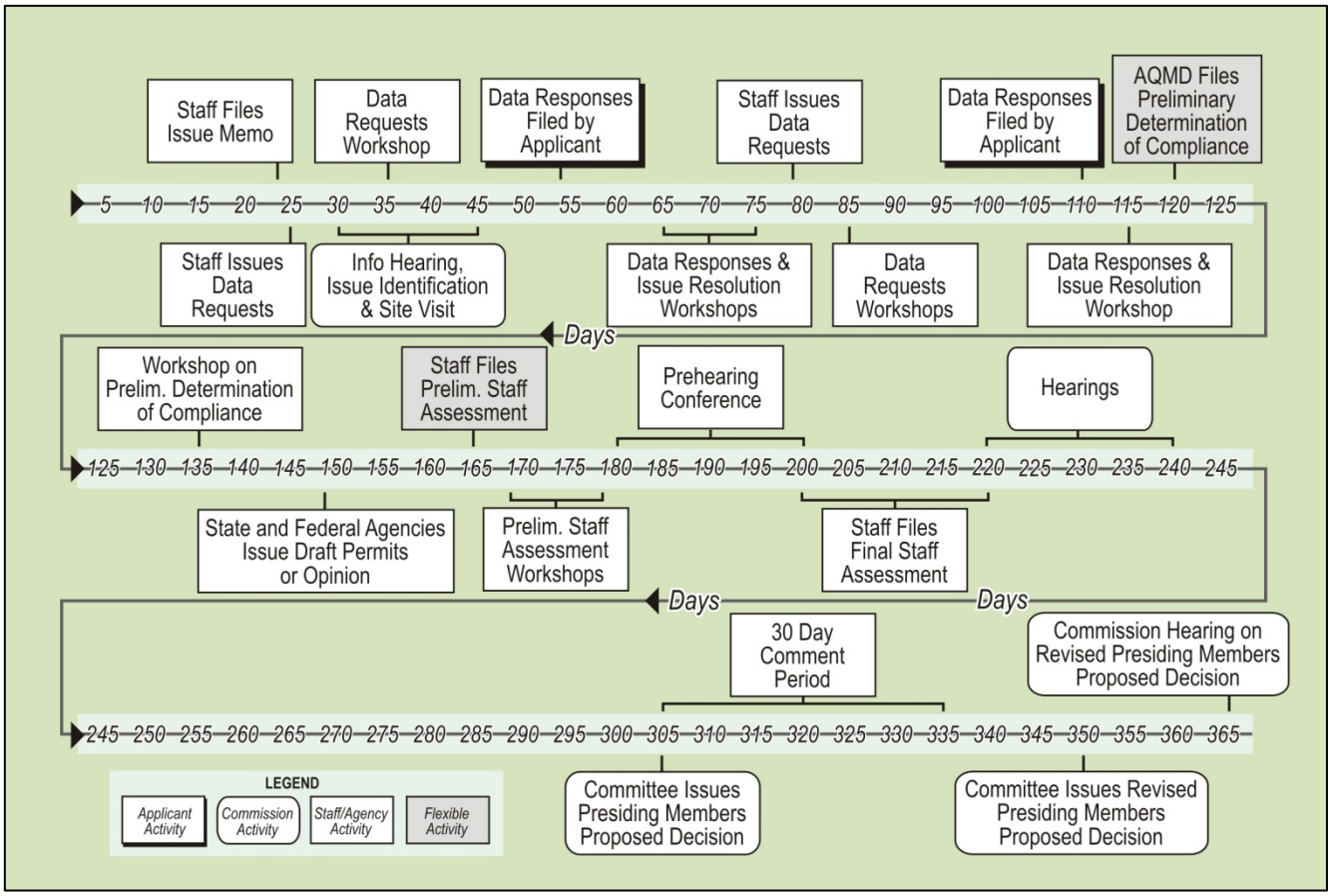
Pre-filing is the period before an applicant submits a formal application, the AFC, to develop an energy facility. Pre-filing consists of meetings between the applicant, Energy Commission staff, and agencies to discuss the project, siting process, filing requirements, and specific issues. When a large thermal power plant has been proposed on federal land, BLM staff participates in the pre-filing meetings.

Under federal law, the BLM is responsible for processing requests for right-of-way (ROW) to authorize and other associated facilities, like transmission lines, on the land it manages. Under the BLM's California Desert Conservation Act (CDCA) Plan (1980), sites associated with power generation or transmission lines that are not identified in the CDCA Plan must be authorized through the plan amendment process. During the ROW grant pre-application period, the BLM works closely with a project applicant to identify feasible sites without known environmental concerns. Applicants then submit a plan of development (POD) for the selected site.

Data Adequacy Phase

After the applicant files the AFC with the Energy Commission Docket Unit, the data adequacy phase begins. The Energy Commission staff reviews the applicant's filing to determine whether the filing contains the information required by the siting regulations. The data adequacy phase must be completed within 45 days.

Figure 5.1 Typical Timeline for a 12-Month AFC Review Process



Source: California Energy Commission

The commencement of the formal siting proceeding can take place only after the Commissioners determine that an application is sufficiently complete based on the information required in the Energy Commission's regulations. If the submission is not data adequate, the applicant will be required to file supplemental information. BLM's approval of a POD requires certain biological and cultural survey data. As soon as the application is deemed data adequate, the clock starts ticking to complete the siting process in the in a period as close to 12 months as possible.

Discovery Phase

After the Energy Commission accepts a filing as data adequate, the Energy Commission staff, agencies, and intervenors begin gathering information. This phase is called "discovery" and usually spans the first 90 days after the filing is deemed data adequate.

The discovery phase is an opportunity for the public to learn about the project. Within 45 days of the data adequacy determination, the Energy Commission committee (two Commissioners assigned to the siting case) will hold one or more public informational presentations and a site visit. The public informational presentations and site visit

may or may not coincide with NEPA public scoping events.

For joint Energy Commission/BLM documents, the BLM must issue a notice of intent to prepare an environmental impact statement to begin the formal NEPA review of the project. This also initiates the public scoping process. During the scoping process, the BLM hosts scoping meetings, information hearings, and site visits, and receives public comments on project issues.

The BLM will also use the NEPA commenting process to consult with and identify Native American and Tribal concerns, including impacts on Indian trust assets. Federal, state, and local agencies, along with Tribes and other stakeholders that may be interested or affected by the BLM's decision on the project, are invited to participate in the scoping process and, if eligible, may request or be requested by the BLM to participate as a cooperating agency.

Information Analysis Phase

During the information analysis phase, the Energy Commission staff, agencies, and participants analyze the project and its various issues. The Energy Commission staff prepares a preliminary staff assessment, and later, the final staff assessment after a 30-day comment period. These reports fully evaluate the project proposal and the environmental setting, and then identify principal adverse environmental effects of the applicant's siting proposal along with any necessary mitigation and recommend conditions of certification. The impact assessments in environmental and engineering areas considered in the Staff Assessment include:

- Air Quality
- Alternatives
- Biological Resources
- Cultural Resources
- Efficiency
- Facility Design
- Geology
- Hazardous Materials
- Land Use
- Noise
- Public Health
- Reliability
- Socioeconomics
- Traffic and Transportation
- Transmission Line Safety
- Transmission System Engineering
- Visual Resources
- Waste Management
- Water and Soils
- Worker Safety

For solar thermal projects under joint Energy Commission/BLM review during 2010, the two agencies prepared a staff assessment/draft environmental impact statement (SA/DEIS), followed by a revised staff assessment (Energy Commission only) and a final environmental impact statement (BLM only) after the appropriate comment period elapsed.

Hearing Phase

The Energy Commission committee then holds the pre-hearing conference during the information analysis phase. This conference is scheduled to prepare and organize information and witnesses for formal evidentiary hearings. The committee will establish procedures to be followed and set the schedules for testimony due dates and future hearings.

The Energy Commission licensing committee conducts formal evidentiary hearings to hear the findings and conclusions of the applicant, staff, intervenors, and other agencies through written, oral and documentary testimony in order to make a decision based on evidence. The public is encouraged to present oral and written comments. The applicant must provide sufficient evidence to prove the facts required by law in order for the Energy Commission to decide to approve a certification or exemption.

Decision Phase

At the conclusion of the hearings, the Presiding Member of the Committee prepares and issues a Presiding Member's Proposed Decision (PMPD). The Presiding Member also sets a public comment period of at least 30 days from the date of distribution and may also hold hearings. The decision to approve or deny an application for certification is usually made at the time and place of the regularly scheduled semimonthly Energy Commission business meeting.

For joint Energy Commission/BLM documents, after the publication of the Final EIS, the BLM allows a comment period on the final EIS. Following the close of the review period and after consultation with the USFWS (under Section 7 of the Endangered Species Act) and the State Office of Historic Preservation (under Section 106 of the National Historic Preservation Act of 1966), the BLM will prepare and issue its Record of Decision on the Right-of-Way and CDCA Plan Amendment. The BLM will then serve a notice of decision to participating parties and will publish its decision in the Federal Register.

A comparison of CEQA and NEPA requirements is shown in Table 5.7 (presented at the end of the section).

Interested Parties

A number of parties can take part in the siting process including:

- The applicant seeking approval for a project through the siting case. Applicants prepare siting documents for processing and decision under these procedures and must provide sufficient evidence to prove the facts required by law for the Energy Commission to approve a certification or exemption.
- Energy Commission staff reviews the siting case as an independent, objective party to the proceeding. The staff coordinates responsibilities with other federal, state, and local agencies, and accomplishes necessary field studies.

- Intervenors are granted formal participation in a siting case. Notice of all meetings, workshops, conferences, and hearings will be sent to the intervenor, and the intervenor may attend and participate in any of these. The intervenor will also have the responsibility of answering data requests from other parties, and responding to committee orders, in addition to presenting its own testimony and expert witnesses and conduct cross examination of other parties' witnesses.

- Members of the public are encouraged to become participants in siting activities. The public can participate without having to intervene in the case. Interested persons will have an opportunity to make a presentation of personal views, listen to, and analyze all other views. These remarks are received as "comments" and are made part of the administrative record and/or the hearing record.

The Energy Commission encourages and invites interested agencies, organizations, associations, and the public to take part in the siting process. The Energy Commission fully considers all input from other government agencies and actively solicits recommendations and can approve a local agency's request for reimbursement to participate.

The Energy Commission's Public Adviser helps the public understand the process and complexities of all Commission meetings, workshops, and hearings and makes recommendations for the best way to be involved. The Energy Commission publishes the Public Adviser Brochure and Public Participation in the Siting Process: Practice and Procedure Guide to explain the different ways the public can participate in the siting process, including information about the ways of getting notified about ongoing projects, methods of participating in projects, and the ways to become an intervenor in a siting case. The brochure also includes the Public Adviser's Office contact information for any additional questions.

California SB 1059 Corridor Designation Process

In recognition of the increasing difficulty in siting new transmission lines, in 2006, California lawmakers and Governor Schwarzenegger approved the implementation of SB 1059. This bill recognized that there is a critical need to develop transmission infrastructure in California, as well as a need to implement an integrated, statewide approach to electric transmission planning and permitting. The intent of SB 1059 is:

> *"…to provide a bridge between the transmission planning process and the permitting process by designating transmission corridor zones (transmission corridors) on state and private lands available for future high-voltage electricity transmission projects, consistent with the state's electricity needs identified in the biennial Integrated Energy Policy Report (Energy Report) and Strategic Transmission Investment Plan (Strategic Plan)".*

For more information, see http://www.energy.ca.gov/sb1059/index.html.

The SB 1059 Corridor Designation process is defined in California Public Resources, Sections 2320 to 2340, and is also described on the Energy Commission's website. In July 2008, the Energy Commission published *Designations of Transmission Corridor Zones Regulations*. Local government's role in transmission corridor designation under SB 1059 is extensive. (See sidebar.) Because no applications for corridors have yet been filed, the process has not been tested. In general, the Commission is required to take the following steps after an application is filed and found to be data adequate:

- Publish a summary of the application in a local newspaper and notify all property owners within or adjacent to the proposed transmission corridor.
- Provide a copy of the application to all affected or responsible jurisdictions publish the application on its website, and notify the public that the application is available. Notify, solicit information from, and confer with cities, counties, state and federal agencies, and California Native American Tribes in whose jurisdiction the transmission corridor is proposed and provide ample opportunity for review of the proposed transmission corridor.
- Solicit comments from stakeholders on the suitability of the proposed transmission corridor with respect to environmental, public health and safety, land use, economic, transmission system impacts, and other factors.
- Within specified time frames, hold informational hearings and a prehearing conference, prepare an environmental report, and issue a proposed decision on designation of the transmission corridor.
- After the designation of a transmission corridor, publish the decision on its website and send notification to specified parties.

The overall transmission corridor designation process is shown in Figure 5.2 (presented at the end of the section).

Utility corridors can vary greatly in size. Utility corridors located on BLM administered land can be up to two miles in width. A DOE National Interest Energy Transmission Corridor encompasses seven counties in Southern California. The Energy Commission requires that the corridor designation application include a detailed description of the proposed transmission corridor, including width (not to exceed 1,500 feet). The RETI and DRECP processes evaluate transmission lines needed to access renewable energy and could help identify transmission corridors that could be reviewed under SB 1059.

New transmission corridors or lines are often controversial, especially if they require new rights-of-way. The Energy Commission has developed an interactive Web-based application known as planning alternative corridors for transmission lines (PACT) to support more useful and informed stakeholder involvement in

Local Government Role in SB 1059 Corridor Designation Process Steps

1. Energy Commission publishes summary of application in each county where corridor is proposed and notifies all property owners who are potentially affected.
2. Energy Commission provides copies of application to cities, counties, and state and federal agencies having an interest in proposed corridor.
3. Energy Commission invites affected cities, counties, state and federal agencies, and the California Native American Tribes to participate in review of proposed transmission corridor.
4. Cities and counties provide comments regarding environmental, public health and safety, land use, economic, transmission system impacts, and other factors.
5. Hearings held in affected county or counties and decision published on Energy Commission website.
6. Copy of decision sent to affected city, county, state and federal agencies, and property owners.
7. Cities and counties notify Energy Commission within 10 days if they receive a land use development application that could impact transmission corridor.
8. Cities or counties must allow Energy Commission up to 60 days for written comment on proposed development.
9. City or county considers Energy Commission comments before making a decision regarding development in question.
10. If Energy Commission objects to project, city or county must respond in writing to explain why it rejected Energy Commission comments and recommendations.

corridor identification and selection. PACT is described in Chapter 6.

CPUC Transmission Line Siting Process

As with the siting of power plants, the siting of transmission lines has a number of phases. To begin a transmission siting process, an IOU under the jurisdiction of the CPUC files an application with the CPUC for a certificate of public convenience and necessity (CPCN) to construct a transmission line larger than 200 kV. A formal proceeding for the application is then opened and overseen by an administrative law judge (ALJ). The CPCN application will include a proponent's environmental assessment (PEA). The need for the project may be based on economic, reliability, or renewable goals, or any combination of the three. The CPUC has two parallel review processes for a transmission application for a CPCN, the environmental review and the general proceeding. *The Transmission Line Application Process: A Step-by-Step Guide* describes this process.

Within 30 days of the CPCN filing date, CPUC staff reviews the application and PEA for completeness and notifies the utility-applicant of whether the application

is complete, or identifies any deficiencies with the application. Once deficiencies have been corrected, CPUC staff informs the applicant that the application is "complete."

Once the application has been deemed complete, the ALJ holds a prehearing conference to discuss issues such as the proper scope of the proceeding, discovery rules, the service list, and the schedule for the proceeding.

Parties may engage in discovery; written data requests are the most common method of discovery in CPUC proceedings. Often, the ALJ, Assigned Commissioner, or the full Commission will set limits on the time for discovery. Sometime after the prehearing conference, the Assigned Commissioner issues a written ruling defining the issues the Commission will consider in the proceeding, and setting the schedule.

Environmental Review

A transmission line environmental review is subject to CEQA (and possibly NEPA) and includes the following. (CEQA and NEPA requirements are discussed in more detail in Table 5.7 below.)

Initial environmental study – When it is not clear whether the Commission must issue either an EIR or a ND under CEQA, CPUC staff will first prepare an initial study. When it is clear that the CPUC must issue an environmental impact report, the staff can omit this step and file a NOP with the State Clearinghouse. If the proposed project involves federal land, the CPUC may develop a joint CEQA/NEPA environmental document with the relevant federal agency.

Public environmental review process begins – CPUC environmental review staff and their consultants conduct public scoping meetings to help identify the range of actions, alternatives, environmental effects, methods of assessment, and mitigation measures that the CPUC will evaluate in its environmental review process.

Draft EIR issues – CPUC environmental staff issues a draft EIR for at least 45 days of public comment. The CPUC usually sponsors public meetings in the area of the project during the comment period.

Final EIR issues – CPUC environmental review staff issues a final EIR, addressing the public comments made on the draft EIR. The purpose of the final EIR is to inform both the public and the decision-makers of the environmental impacts of the project and any alternatives, design a recommended mitigation program to reduce any potentially significant impacts, and identify, from an environmental perspective, a preferred alternative. In making a final determination on the application, the CPUC will consider the information contained in the final EIR/EIS as well as in the formal evidentiary record created as part of the proceeding.

CPUC General Proceeding

The CPUC's general proceeding is a formal review process in which the CPUC considers how approval of a project might impact the public interest. The general

proceeding includes, as stated in the Public Utilities Code §1002.3, the consideration of cost-effective alternatives to transmission facilities that meet the need for an efficient, reliable, and affordable supply of electricity. A general proceeding can include pre-hearing conferences, evidentiary hearings, and public participation hearings. The CPUC will seek a decision about the project that strikes a balance among power production, land use, environmental stewardship, and other factors. A CPUC Assigned Commissioner and an ALJ are in charge of the general proceeding, which may in part occur while the environmental review is underway.

The proceedings offer stakeholders and qualified experts the opportunity to offer their opinions on various aspects of the proposed project, including need and cost-benefit of the project. After giving expert testimony, the witnesses are offered for cross-examination by other participants in the proceeding.

CPUC Decision-Making Process

When both the environmental evaluation and general proceeding are complete, the ALJ writes the proposed decision based on the record in the proceeding, and the CPUC distributes it to parties. Individual Commissioners have the option of preparing proposed decisions of their own, called alternate decisions. If the Assigned Commissioner wishes to sponsor an alternate, he or she must mail it at the same time as the proposed decision. Parties have an opportunity to file comments on the proposed and alternate decision(s).

Commission vote – The ALJ may amend the proposed decision in response to comments received. Similarly, a Commissioner offering an alternate may amend it. No sooner than 30 days after the CPUC mails the proposed decision to the parties, the CPUC Commissioners may vote on the decision. The CPUC may reject or accept a proposed or alternate decision in its entirety or change it in any way consistent with the law and evidentiary record.

POU Transmission Line Siting Process

POUs typically develop annual transmission plans on a multi-year basis, as well as a 10-year basis. The POU submits its 10-year transmission plan to the Energy Commission. Transmission planning may be coordinated with other transmission providers if the line involves other jurisdictions. The POU would work with stakeholders to identify a preferred transmission line route as well as alternative routes.

The POU would serve as lead agency for the CEQA review of the project. An Initial Study/Mitigated Negative Declaration (IS/MND) or an Environmental Impact Report (EIR) would be prepared to: 1) inform decision makers and the public of the potential environmental impacts that are expected to result from the construction, operation, and maintenance of the proposed project; 2) determine ways to minimize or avoid significant effects; and 3) identify alternatives that may avoid or minimize potential significant impacts.

The draft document would be circulated for public review during which time public hearings and public workshops would be conducted. Comments received would be addressed and incorporated into the Final environmental document. Decision making would be in the hands of the POU Board, which would consider both the environmental document and all comments received during the public review period when considering approval of the project.

Table 5.6: Comparison of CEQA and NEPA Requirements

EIR Requirements (CEQA)	EIS Requirements (NEPA)
Notice of Preparation (NOP) • Must include: project description, location of project (with topographical map), a discussion of potentially significant environmental issues. • Filed with State Clearinghouse/Office of Planning and Research (OPR) and appropriate county and city clerks. • Must be sent to responsible and trustee agencies, involved federal agencies, and parties previously requesting notice in writing. • Must be sent by either certified mail or other method of transmittal that provides a record of receipt (proof of service). • May be sent to all parties who might be interested in the project, including neighboring landowners, but not required.	**Notice of Intent (NOI)** • Must include: description of the proposed action and alternatives, scoping process, and information on scoping meetings, and lead agency contact information. • Published in the Federal Register. • Published in local newspapers and sent to interested agencies and organizations. • May send NOI to the State Clearinghouse and property owners, but not required.
Scoping Process (30 days) • 30-day period that begins with issuance of the Notice of Preparation. • Formal scoping meetings optional, but not required, except for projects affecting highways (at the request of the Department of Transportation) or projects of statewide/regional/area-wide significance. • Solicits comments from public and potentially affected agencies.	**Scoping Process** • Initiation of the scoping period must occur with issuance of the NOI, but may begin earlier if there is appropriate public notice and information available. • Time limits may be set for determining the scope of the EIS, at the discretion of the federal lead agency. • Formal scoping meetings are optional under NEPA, but may be required by the individual agencies.
Draft EIR • Must include analysis of the significant environmental effects of the project, including direct, indirect, short-term, long-term, cumulative, and unavoidable impacts, as well as any impacts related to required mitigation. • Requires meaningful evaluation of alternatives that reduce significant impacts, but in less detail than the proposed project. At a minimum, the "no-project" and environmentally superior alternatives must be addressed. • Must file 1 copy of Notice of Completion (NOC) and 15 copies of DEIR with State Clearinghouse.	**Draft EIS** • Must determine if proposed action has the potential to significantly affect the quality of the human environment, including direct, indirect, cumulative, growth-inducing, and unavoidable effects. • Requires full range of alternatives to be evaluated in relatively similar level of detail as the proposed action, including the "no project" alternative. • Must file draft EIS with the U.S. Environmental Protection Agency (USEPA).
Agency/Public Review and Comment (45 days typical) • 45-day period that begins with submittal of draft EIR and NOC to State Clearinghouse. • Notice of Availability (NOA) must be issued to county	**Agency/Public Review and Comment (45 days)** • Minimum 45-day period that begins with publication of the Notice of Availability (NOA) in the Federal Register by USEPA.

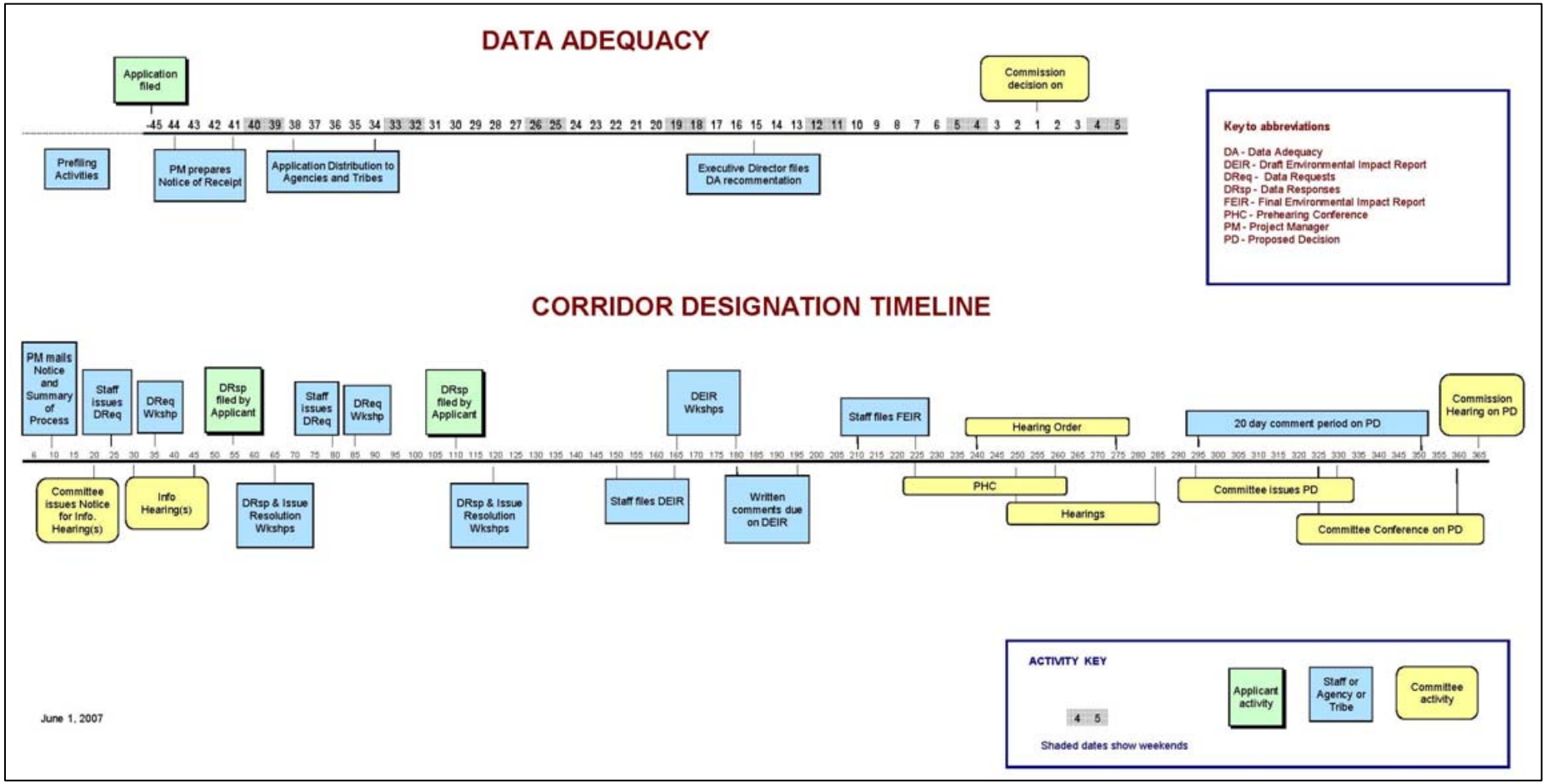
EIR Requirements (CEQA)	EIS Requirements (NEPA)
clerk, responsible and trustee agencies, involved federal agencies, and parties previously requesting notice in writing. • NOA must be published in a newspaper of general circulation, posted on and off the project site, or directly mailed to neighboring landowners. • Formal public hearings to solicit comments are not required.	• A request to comment, or the NOA, must be sent to any federal agency which has jurisdiction by law or special expertise with respect to any environmental impact, appropriate state and local agencies, Indian tribes when appropriate, and any agency which has requested that it receive statements on the actions of the kind proposed. • Must send Draft EIS to federal agencies with jurisdiction by law or special expertise, environmental regulatory agencies, project applicant, and parties requesting copies. • Must conduct public hearings if there is substantial environmental controversy, substantial interest in a hearing, or if requested by a federal agency with jurisdiction over the action.
Recirculation • Must recirculate an EIR to responsible and trustee agencies for consultation and give new public notice whenever significant new information has been added to the EIR after the draft has been available for review, but before certification of the final EIR.	**Recirculation** • If a cooperating agency with jurisdiction by law determines that the EIS is wrong or inadequate, it must prepare a supplement to the EIS, replacing or adding any needed information, and must circulate the supplement as a draft for public and agency review and comment.
Final EIR • Contains original or revised Draft EIR; comments received, either verbatim or in summary, and list of those commenting; and lead agency's responses to significant environmental points raised in review and consultation process. • Must provide copy of lead agency's responses to any public agency that submitted comments at least 10 days prior to certifying final EIR. • Lead agency must certify final EIR before approving the project. • May file final EIR with State Clearinghouse, but not required. • May provide public review period for final EIR, but not required.	**Final EIS** • Contains lead agency's responses to all received comments; discusses any opposing views on issues. • Must file final EIS with USEPA and publish NOA in Federal Register. • 30-day public review of Final EIS begins with publication of NOA in Federal Register. • Must provide final EIS to federal agencies with jurisdiction by law or special expertise, environmental regulatory agencies, project applicant, parties requesting copies of EIS, and parties who submitted substantive comments. • Agency may adopt final EIS following 30-day review period.
Findings • Findings are made at the time project is approved. • Findings must explain how lead agency dealt with each significant impact in the EIR. **Mitigation** • Must include mitigation measures that reduce all significant impacts to a less than significant level, or justify why project should be approved regardless of	**Mitigation** • EIS must suggest mitigation measures that would reduce any potentially significant effects to the extent feasible, but there is no requirement for the agency to impose them, even if feasible.

EIR Requirements (CEQA)	EIS Requirements (NEPA)
impacts (see Statement of Overriding Consideration). Must include mitigation measures to reduce impacts to the extent feasible, even with Statement of Overriding Consideration. • Must adopt mitigation monitoring program in conjunction with project approval. • Program must ensure compliance with mitigation measures. **Statement of Overriding Consideration** • Must be prepared if approving a project with unavoidable significant impacts; • Statement must explain why lead agency is willing to approve the project, in spite of each significant effect.	
Notice of Determination (NOD) • Must file NOD with county clerk within 5 working days of project approval; • Must file NOD with State Clearinghouse if discretionary approval (e.g., permits) is required from a state agency; • Filing of the NOD begins 30-day statute of limitations on court challenges to the lead agency's decision.	**Record of Decision (ROD)** • Decision may not be made until 90 days after publication of NOI for the draft EIS or 30 days after publication of NOA for final EIS, whichever occurs last. • ROD must include explanation of the agency's decision, alternatives considered, and monitoring and enforcement program for adopted mitigation measures. • ROD must be made available to the public. • May publish ROD in Federal Register, but not required. • No statute of limitations is provided under NEPA, although the six-year federal limit generally applies.
Appeal • NOD triggers a 30-day statute of limitations for CEQA litigation. • If the notice is not filed with the County Clerk or OPR, the statute of limitations becomes 180 days from the date the decision is made to carry out or approve a project, or where no formal decision is required, 180 days from the date the project is commenced	**Appeal** • NEPA regulations provide for an administrative appeal process of the final decision. The exact process is detailed in the individual agency NEPA regulations. • Appeals process/period is usually 30 days after the draft agency ROD has been issued/published in the Federal Register
Major Differences to Be Considered	
Time Limits. NEPA documents are not subject to specific time limits. In contrast, non-agency (private) CEQA development projects are subject to the Permit Streamlining Act. Projects with federal involvement may be exempt from these requirements. **Alternatives.** NEPA requires an evaluation of all reasonable alternatives in similar detail to the proposed action/preferred alternative [40 C.F.R. 1502.14]. CEQA requires an evaluation of the comparative merits of each alternative, but in less detail than the proposed project.	

EIR Requirements (CEQA)	EIS Requirements (NEPA)
Socioeconomic Impacts. Under NEPA, economic and social effects must be discussed if they are related to a physical or human impact. Under CEQA, economic and social changes resulting from a project are not treated as significant effects on the environment. However, if a physical change in the environment will result in economic and social changes, which in turn have secondary physical effects (for example, loss of shopper's results in the physical deterioration of an area); those effects must be evaluated in an EIR. **Public Review.** NEPA requires public notice and review of the final EIS (typically 30 days), while CEQA does not require public review of the final EIR. Under CEQA, reviewing agencies must be provided with responses to their comments at least 10 days prior to certification of the final EIR. **Statute of Limitations.** NEPA contains no specific statute of limitations. CEQA provides a short statute of limitation for legal challenges (30 days from date of project approval if a NOD is filed; 180 days if no NOD).	

Source: CEQA and NEPA Documentation

Figure 5.2: California Energy Commission Transmission Line Corridor Designation Timeline



Source: California Energy Commission

Chapter 6: Local Government Involvement in Planning for and Permitting of Energy Infrastructure

Introduction

Local government involvement in the energy infrastructure development planning process is essential, even when the local agency is not the permitting authority. This chapter contains information and recommendations for local energy infrastructure planning. It also discusses the increasing role of local governments as the state expands its energy goals and the legal authority for local government involvement in the energy system planning process.

Energy infrastructure planning is important to a community's future and presents both challenges and opportunities for local governments. As awareness of the importance of electricity in society grows, local decision-makers and planners are confronted with public concerns about the potential impacts and benefits of energy generation and transmission facilities.

Community concerns may include the potential for impacts to public health and safety, air quality, water supplies and quality, aesthetics, sensitive species habitat, and the local economy, including property values. Local businesses may focus on positive aspects, such as jobs, a new source of retail sales, and an increased tax base. Educators may see an opportunity to add renewable energy training to their curriculum, and developers and Realtors envision the potential for growth.

Planning that links all partners will help communities provide for growth and development in a sustainable manner. Numerous examples of ways some communities have addressed their energy planning challenges are included in this chapter.

The Benefits of Energy-Aware Infrastructure Planning for Local Governments

Energy facilities are indispensable elements of a community's infrastructure. The energy produced and distributed makes homes comfortable, moves people and goods, operates the machinery of industry and powers other infrastructures that underpin communities. The growing importance of electricity in an increasingly technological society becomes especially apparent during power outages, such as those occurring in 2000.

The availability, reliability, and price of energy often affect plans for local development, especially in the commercial and industrial sectors. Just as local planners and economists consider the price and availability of public infrastructure, such as water and roads, energy information is also necessary to accurately project and prepare for future growth.

Local and regional planning documents, such as the general plan, community plans, mobility plans, and regional transportation plans should consider the need for reliable sources of electrical power to meet future demands and the facilities necessary to ensure that supply. These plans should also weigh the costs of infrastructure

development to the local economy and environment.

Government entities that are aware of the land use issues, environmental sensitivities, and infrastructure needs of their communities are better prepared to discuss future development and associated energy needs with those involved in these developments. Informed local governments are also better able to work jointly with the state to meet California's aggressive renewable energy and climate change goals.

The energy choices that a community makes today will have significant effects on tomorrow's economy, environment, and quality of life. Therefore, communities that plan for energy facilities to meet those needs will be better equipped to obtain reliable, affordable, and environmentally sound energy supplies. This is especially important if communities are going to meet California's zero net-energy standards for residential and commercial developments in 2020 and 2030, respectively.

When development standards for energy facilities are already integrated into community planning documents and zoning codes, decision-makers will be better informed, permitting applications can be processed more expediently, and there should be fewer costs and less controversy for all stakeholders. This is no different than planning approaches for other key facilities such as schools, parks, roads, and water and wastewater systems. Such upfront planning:

- Provides advance guidance to energy facility developers on desirable and undesirable project types and locations.
- Avoids or minimizes conflicts with environmental and economic resources such as wildlife habitat and scenic qualities that support tourism and recreation.
- Creates jobs from local energy resource and facility development.
- Increases public familiarity with energy facilities and their critical role in community livability, economic competitiveness, and sustainability.
- Builds a relationship among developers, utilities, government agencies, local interest groups, and other stakeholders that can facilitate future siting and permitting of energy facilities.

Regional energy plans should be considered when issues affect more than one city or county. The scale of the energy industry often means that more than one community may be affected by supplier decisions regarding new resources expansion of a service area, or increased demand. A regional response is often the most valuable way to adequately consider these actions. This is especially true for solar projects that involve many thousands of acres, lengthy transmission corridors, and resources that may affect many adjacent communities. An example of regional planning is provided in the sidebar on the San Diego Association of Governments.

The Legal Authority for Local Energy Facilities Planning

In contrast to state and federal permitting where local governments often have limited authority, local planning for energy facilities is authorized under California's land-use planning statutes. This can include planning that guides subsequent permitting where local government is the lead siting agency or planning in an advisory manner as input into municipal, state, or federal permitting processes.

City, county, and Tribal governments are the permitting authority for electricity generators under 50 MW and for any non-thermal independent generators, except for facilities such as dams, which are under federal jurisdiction. As local electricity generation increases (for example, rooftop solar PV and small-scale facilities near distribution lines), local planning and public works departments, planning commissions, and board of supervisors or city councils will be called upon to address the industry's siting needs and permitting requirements. Advance planning for such eventualities will allow local governments to encourage energy infrastructure development while still protecting the area's resources.

The legal authority to plan locally for energy facilities is found in California laws, ordinances, regulations, and standards (LORS) and legal precedent relating to police powers and the development of local planning documents, including general plans, area and community plans, and specific plans.

San Diego Association of Governments (SANDAG)

The San Diego Association of Governments (SANDAG) is composed of mayors, council members, and supervisors from each of the San Diego region's 19 local governments. SANDAG serves as a forum for decision-making on regional issues such as growth, transportation, land use, and housing; the economy; the environment; and criminal justice. SANDAG has prepared a long-term energy plan that serves as the energy policy guideline for the region, similar to California's *Integrated Energy Policy Report*. SANDAG's Regional Energy Planning Program provides input and direction on implementing the SANDAG Regional Energy Strategy 2003 (RES). The RES was adopted in July 2003 by the SANDAG Board and incorporated into the SANDAG Regional Comprehensive Plan (RCP) in 2004. SANDAG also works with federal and state energy planning/regulating agencies to help the region meet energy goals.

SANDAG'S RCP identifies policies and objectives for Planning and Design and Coordination related to this area, as follows:

a) Promote the local production of cost-effective, environmentally sensitive energy to reduce dependence on imported energy.

b) Promote development regulations and design standards to maximize energy efficiency and minimize potential health risks.

c) Create opportunities to coordinate energy supply strategies between governments in the greater border region.

d) Locate energy facilities, such as power plants and/or transmission lines, so that lower income and minority communities are not disproportionately negatively affected.

General Plans

Government Code (GC) § 65300 requires that every jurisdiction adopt a "comprehensive, long-term general plan for the physical development of the county or city." A truly comprehensive general plan will cover all locally relevant physical, social, and economic issues. GC §§ 65302 and 65303 provide the flexibility for local governments to include energy infrastructure in local land use and planning statutes. For example,

> *"The general plan shall include a land use element which designates the proposed general distribution and general location and extent of … public and private uses of land."*
>
> *"The general plan may include any other elements or address any other subjects which, in the judgment of the legislative body, relate to the physical development of the county or city."*

The Governor's Office of Planning and Research *General Plan Guidelines (2003)* advises planners that "communities may consolidate energy policies in an optional energy element. An energy element can help integrate the economic and environmental effects of energy costs and benefits into a city's or county's long-term growth planning. An energy element can be a useful component of a sustainable development strategy."

At present, approximately 60 California cities and counties have used this authority to fashion general plan energy elements. The list below shows the jurisdictions where local energy elements are in place. Examples of energy elements are discussed in the sidebar on the Humboldt County Energy Element and the Imperial County Transmission Line Element

- Alameda 1979
- Alameda County 1994
- Alpine County 1999
- Alturas 1993
- Arcata 2008
- Banning 2006
- Beaumont 2007
- Belvedere2004
- Benicia 1999
- Calabasas 1995
- Cathedral City 2002
- Davis 2001
- Desert Hot Springs 2000
- Downey 2005
- Emeryville 1993
- Escondido 2001
- Gilroy 2002
- Glenn County 1992
- Indian Wells 1996
- Irvine 2000
- Kern County 2004
- Lassen County 1993
- Loma Linda 2006
- Los Gatos 1985
- Lynwood 2003
- Madera County 1995
- Marin County 2007
- Modoc County 1993
- Mono County 1993
- Orland 2003
- Palm Desert 2004
- Palo Alto 1998
- Paradise 1994
- Pasadena 1987
- Petaluma 2008
- Placer County 1994
- Portola 2001
- Poway 1991
- Rancho Mirage 2005
- Sacramento County 1979
- San Bernardino 2005
- San Clemente 1993
- San Diego County 1990
- San Joaquin County 1992
- San Jose 1994
- San Luis Obispo 1981
- San Luis Obispo County 1995
- Santa Ana 1982
- Santa Barbara County 1994
- Santa Cruz NA
- Santa Cruz County 1994
- Shafter 2005
- Shasta County 2004
- Sierra County 1996
- Siskiyou County 1993
- Solano County 2008
- Ukiah 1995
- Ventura County 1988
- West Hollywood 1988
- Wheatland 2006
- Yolo County 1982

County of Humboldt Energy Element

Humboldt County, with assistance from the Redwood Coast Energy Authority, has developed a detailed energy element, establishing goals and objectives that lay out, with some specificity, how energy concerns are to be included in the planning process. The element sets out four goals: strategic energy planning; energy efficiency and conservation; renewable energy, distributed generation, and cogeneration; and local management of energy supply. A comprehensive list of objectives supports these goals and speaks to a range of concerns and values motivating the county, including:

- Regional energy authority
- Energy-related research and economic development
- Countywide site design standard©
- Public services, facilities, and operations
- Water, wastewater, and solid waste management
- New energy production and transmission facilities
- Emergency preparedness planning
- Planning of active and healthy communities
- energy education and policy dissemination
- Building
- Renewable energy, distribution, and cogeneration
- Local utility development and management options

Imperial County Transmission Line Element

Imperial County contains one of the largest geothermal energy resource areas in the nation. The region also has more than 350 days of sunshine per year, making it ideal for development of solar facilities.

Given these abundant renewable energy sources, the county recognizes that major transmission facilities are likely to occur in the County over the next decade. In 2006, the county expanded the geothermal/alternative energy and transmission element of its general plan. The expanded element provides guidance for public input into the planning process for future siting of electrical transmission lines in the county. The three guiding principles are:

- Recognize the necessity for transmission corridors within and through Imperial County.
- Plan for the least disruptive corridor routing and encourage the development of joint use corridors.
- Formalize the county's input to the appropriate public and private entities in terms of goals, policies, routing criteria, and specific corridor location plans.

The element recognizes that the prolific energy sources within the county will increase the number of power plants and transmission corridors and examines the idea of developing "energy production centers or energy parks," to encourage facility co-location and prohibiting urban encroachment on existing and future energy resource areas. The element also establishes new regional transmission corridors and recommends safeguarding existing corridors that are located within the population centers while ensuring that development does not impact the corridors. The element includes maps of proposed transmission lines and potential locations for new power generating facilities, including energy parks. The element considered the possible impact that transmission systems can have on agricultural land, wildlife, and the natural desert landscape when planning and designing transmission corridors.

Area and Community Plans

Area and community plans address a particular region or community within a planning jurisdiction. They are legally part of the general plan and serve to refine general plan policies as they apply to a smaller area. Since they are legally part of the general plan, they can address energy facilities under the same statutory authority cited above.

Specific Plans

Specific plans, which are separate and legally distinct from general plans, provide criteria and standards for specific development projects or areas.

A specific plan would provide:

- The distribution, location, and extent of the uses of land, including open space, within the area covered by the plan.
- The proposed distribution, location, extent, and intensity of the major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy, and other essential facilities proposed to be located within the area covered by the plan and needed to support the land uses described in the plan.
- Standards and criteria by which development may proceed, and standards for the conservation, development, and use of natural resources, where applicable.
- A program of implementation measures including regulations, programs, public works projects, and financing measures necessary to carry out the plan requirements.

The Importance of Local Plans in State and Federal Processes

In addition to a local government's legal authority to conduct energy facility planning, the resulting local plans have an important role in the state and federal planning and permitting processes. State and federal agencies with energy facility responsibilities encourage local planning as a means of identifying local needs and preferences, reducing jurisdictional conflicts, and expediting the timely and orderly permitting and development of energy facilities when and where they are ultimately needed.

Traditionally, IOUs and POUs plan for new facilities in their individual service areas. However, utilities and local jurisdictional agencies should consult on proposed energy facility projects and system planning as early as possible so that new developments can be consistent with existing local planning requirements and planning objectives can be incorporated into local land use plans and ordinances, as much as possible.

Even when local governments do not have jurisdictional authority, they may play an important advisory role in the planning and permitting process. Energy Commission staff carefully assesses each new power plant application for compliance with local LORS. Staff also takes into consideration the local policies, conditions, and preferences for the location and type of facilities that would best serve each community. Regula-

tions require this information be considered in staff's environmental analysis and at Commission hearings on the facility application. This information is best and most accurately provided by the local government entities, as expressed in their codes, ordinances, and community planning documents.

When planning or considering proposals for linear facilities, such as transmission lines, it is helpful to have written policies discussing the nature and location of resources such as wetland habitat areas that the city or county considers valuable. Many counties also have local ordinances requiring that linear facilities share common corridors through farmlands. When the Energy Commission or the CPUC certifies a project in those counties, the county ordinances may be incorporated in the design of the facilities. (See sidebar on "Imperial County Transmission Line Element").

The BLM and the U.S. Forest Service (USFS) both require that their land management plans consider local land-use policies. Consideration of local land-use plans is also a requirement during CEQA and NEPA reviews of energy facilities permitted by state and federal agencies.

Local Energy Facility Planning

Long-range energy planning provides benefits to both local government and utilities. It can reduce political controversy when a specific generation facility or transmission line is proposed; improve land use and resource compatibility; avoid redundancy when siting new facilities or lines; and promote collaboration among the public, utilities, and community agency staff. The following section describes the kinds of information that could be compiled by local governments.

Prepare an inventory of current energy usage. An examination of current energy usage would be helpful in determining future energy needs for all sectors of the community including: residential, commercial, institutional, industrial, agriculture, transportation, and infrastructure. It would also be helpful to examine the environmental and economic impacts of local energy usage.

Determine future demands for energy supplies. Energy policies (such as AB 32) and the availability and use of fuels will largely dictate energy facility needs. However, local demands may be influenced by other considerations, such as population growth, economic and environmental impact and constraints, greenhouse gas reduction sustainability goals and climate action plans, and development/growth preferences, as expressed in general and community plans, regional transportation plans, zoning codes, and ordinances.

Determine the potential for meeting future energy demand. This determination includes the following interrelated steps:

- **Assess how well existing energy facilities can meet future energy requirements and what new or modified facilities can be used or will be needed.** For example, a community's existing electric system may be able to accommodate community growth for

the next 10-15 years, but after that it may require new generation, transmission, and distribution capacity.

- **Assess efficiency improvement potentials.** Community efficiency improvements can be considered as a means of meeting community energy needs and as an alternative to new facilities.

- **Assess potential energy resources and sites.** In its general plan, the local jurisdiction should consider the development of local renewable and/or nonrenewable energy resources. Many California jurisdictions are developing and using solar energy, landfill gas, and cogeneration. Communities should also consider possible sites for additional transmission corridors.

Determine community environmental and economic preferences for meeting future needs, considering the feasible facility options. For example, if new electric supplies are needed, a community can consider its preferences for repowering existing plants, developing renewable resources, cogeneration opportunities, building new, large central plants, or building new, smaller plants distributed closer to consumers. Each of these options has different environmental and economic implications that need to be weighed by the locality in collaboration with utilities and other stakeholders.

Cities and counties are allowed by law to procure or generate electricity for consumers within their jurisdiction. The IOUs would continue to provide transmission and distribution services. This is referred to as community choice aggregation.

Formulate and adopt policies and standards for siting, operating, and closure/reclamation of energy facilities expected in the jurisdiction. This can include clear designation of geographic areas suitable and unsuitable for energy facilities, and design and performance standards that compatibly integrate facilities with their surroundings. Geographic suitability surveys should be focused in particular on appropriate locations and zoning for electric power plants and transmission lines as these are often some of the most intrusive facilities developed in a community.

One of the most important benefits of local planning is the guidance it provides to energy facility developers in advance of their specific project preparations. Local plans that contain policies and standards for evaluating and siting facilities help developers better understand community preferences and expectations. Facilities can be sited and designed to address guidelines from the outset, avoiding or minimizing disputes and delays in providing needed energy supplies. Local planning also reduces project-related costs for all participants.

Incorporate designated transmission line corridors in local plans. After receiving notice of a proposed transmission corridor designation (per SB 1059, see Chapter 5), each city or county should consider the designated transmission corridor zone

when making any land use changes that could affect the corridor designation. Compatible uses within or adjacent to a designated transmission corridor zone are allowed.

If a city or county receives a land use development application that could impact the transmission corridor, it is required to notify the Energy Commission of the project within 10 days. The city or county must also allow the Energy Commission up to 60 days for written comment on the proposed development.

The Energy Commission must recommend revisions to, redesign of, or mitigation for the proposed project to reduce the impacts to the designated transmission corridor. The city or county must consider these comments before making a decision regarding the development in question.

If the Energy Commission objects to the project, the city or county must respond in writing as to why it rejected the Energy Commission comments and recommendations.

The Information Base Necessary for Energy Facilities Planning

To effectively conduct energy facility planning, communities must compile and maintain up-to-date information on relevant energy issues and trends affecting local energy facility needs and development. Chapter 3 details the most recent policies and laws shaping future energy needs. A solid information base is particularly important because of changing technology, market, and regulatory conditions in the energy industry and local economic and environmental constraints. A thorough and well-organized information base can help stretch limited staff resources and facilitate planning and permitting coordination with all stakeholders. This information base allows local governments to clearly articulate why new energy facilities are needed.

To undertake energy facility planning, local jurisdictions should assemble the information presented below and shown in Table 6.1.

Table 6.1: Framework for a Local Energy Facility Plan

Key Issue Questions	Stakeholders/Information Sources	Policy & Implementation Choices
What is the forecasted increase in energy demands? What are the reasons for the increase? Have demand-side efficiency improvements in land use, transportation, and infrastructure already been accounted for?	Electric and natural gas utilities, Energy Commission, CPUC, Council of Governments (COG)	See ***Energy Aware Planning Guide*** (Volume 1) options such as mixed use development; clustering and compact, diverse housing; integrated street networks, and transit-orientated development.
What facilities currently deliver energy supplies into the community from the surrounding region? How diverse and reliable are they? Are they sufficient to meet current demand?	Utilities, independent power producers (IPP), Energy Commission, CPUC	Coordination mechanisms with other communities sharing the same regional supply networks, participation and advocacy in regional planning processes.
What energy facilities presently exist in the jurisdiction, and what are their capacities and condition? Any being decommissioned or repowered?	Utilities, IPPs, Energy Commission, CPUC	Trade-offs between decommissioning, repowering, and new facilities.
What new energy facilities will be required in the future to accommodate local growth or to meet state energy goals? What are preferable fuels and technologies?	Local interest groups, utilities, IPPs, Energy Commission, CPUC, CAISO	Advocacy of preferred fuels and technologies; emissions inventories.
What locations in the jurisdiction are especially suitable or unsuitable for energy facilities? What are major siting issues?	Natural resources agencies, local interest groups, utilities, IPPS, Energy Commission, CPUC, COG	Site-banking and protection of significant long-term energy production areas, designation of unsuitable energy facilities areas; zoning designations and development standards.
What local natural resources are attractive to energy developers and how acceptable is their use?	Natural resources agencies including the State Lands Commission; local interest groups; utilities; IPPs; Energy Commission; CPUC; WGA	Sustainable resource management plans and best management practices for sites deemed suitable for facilities; habitat conservation plans.
How many local jobs are currently supported by energy facilities, and how many new jobs are possible in the future with new facilities? Would there be property tax exemptions for certain types of facilities?	Utilities, IPPS, economic development agencies, chambers of commerce	Incentives for facilities with positive local employment effects.
What legal authorities and regulations apply to energy facility development?	Energy Commission, CPUC, FERC, natural resource agencies	Coordination and mechanisms for efficient intergovernmental action.

Source: Aspen Environmental Group

Population growth trends and basic demographic information. Population growth and trends will be a factor in determining potential future energy facility-related needs. Energy needs will be affected by whether "smart growth' is implemented, new construction is zero net energy, and the degree to which energy needs are reduced by demand response and energy efficiency. The local utilities will be an essential partner in determining future needs.

Regional energy supply system characteristics. Communities are supplied with energy largely from regional systems that produce and distribute electricity, natural gas, and transportation fuels. A first step in local planning is to learn what these systems are, who owns them, and how they operate. Systems of interest should include:

1. Electric power plants with output that serves the region.
2. Large electric transmission lines from power plants to communities.
3. Petroleum refineries that produce petroleum products from crude oil.
4. Large pipelines that convey natural gas and petroleum products from production sites to communities.
5. Interconnective infrastructure facilities for communities not directly served by large pipeline or transmission line corridors.

Because these regional systems influence local facilities, it is important to know if they are operating satisfactorily, if there are plans to expand them, where future expansion may occur, and the potential impact regional changes can have on local jurisdictions.

Existing energy facilities in your jurisdiction. In addition to regional facilities, it is also important to know what types of facilities are present locally. The same type of data should be inventoried, particularly facilities that may be expanded, or in the case of some older power plants, repowered. Any pending proposals for new energy facility development should also be included. These data will indicate where the jurisdiction's energy services are adequate or constrained.

Technologies likely to be used in new energy facilities. An understanding of the technologies used in energy facilities is necessary to assess their probable operating characteristics and environmental impacts, and in turn, the policies and standards that should be applied to them. Chapter 7 identifies the most common energy infrastructure encountered by local governments and the environmental impacts associated with this infrastructure.

Indigenous natural energy resources. Energy facilities are often developed in conjunction with local indigenous resources used to fuel the facilities. Renewables such as wind and solar resources are "fuels" that must be considered along with the electric-ity generation facilities that use them. Use of these resources may involve large land areas, raising significant planning issues about compatible land uses and environ-mental impacts. The same is true for oil and natural gas fields that require collection and storage facilities. If a jurisdiction has

significant indigenous energy resources, advance planning allows communities to determine which sites should be protected for future energy production or reserved for a more important competing use. This planning can protect significant energy sites from conflicting uses and insure long-term energy availability and output. An example is the Solano County Wind Turbine Plan. (See sidebar.)

Environmental conditions and constraints. Energy facilities can have significant requirements for land area, water supplies, pollution control technologies, access, and hazardous materials handling. They can also have significant direct, indirect, and cumulative impacts on local aesthetics, noise levels, wildlife habitat, and other sensitive environmental resources. A thorough environmental database is essential for correctly gauging these potential impacts and formulating plans accordingly.

Planning Tools

Economic development opportunities. In addition to providing a reliable supply of power, energy facilities also provide jobs and other economic benefits. When establishing local policies and standards, it is important to recognize job creation, goods and service purchases, and tax revenues that can result from energy facility development. For example, a jurisdiction whose goal is energy supply diversification could give preference to local renewable resource development for both its diversity benefits and local employment created by facility construction and renewable energy production.

This employment can include resources production, such as geothermal steam supply jobs; power production, such as solar panel manufacturing for rooftop solar and distributed generation solar facilities; and maintenance jobs to support such facilities and operations. All of this energy facility employment, in turn, creates "multiplier" jobs that are spin-offs from direct energy jobs.

Non-local regulatory authorities and standards. An understanding of permits and regulations that will be applied to facilities by regional, state, and federal agencies is important when determining appropriate local policies and standards. For example, hydroelectric power plants are already subject to extensive state and federal rules, whereas wind power facilities are not. Local planning structure should be consistent with other governmental authorities to avoid duplication or conflict and should focus on topics of local concern not addressed by other agencies.

Chapter 5 details the various permitting powers of state and federal agencies. Chapter 7 discusses the permitting issues associated with specific types of energy facilities.

Solano County Wind Turbine Siting Plan

Solano County is geographically distinguished for producing wind energy and is one of five major utility-scale producers of wind energy in California. The Solano County Energy Element includes The Solano County Wind Turbine Siting Plan. The plan establishes goals specifically related to wind energy by:

- Encouraging the siting of large-scale wind turbine electric generation facilities.
- Delineating wind resource areas.
- Providing policies that will conserve wind resource areas.
- Providing policies that will protect these areas from non-compatible uses.

The plan became part of the energy element when it was adopted in 1987 and has been updated several times since then.

Solano County has incorporated the Energy Commission's wind resource area maps in its general plan. Applicants interested in obtaining permits for commercial wind turbine installation are directed to these maps to determine if the wind resource in their area is sufficient.

Program level EIRs (PEIRs) address impacts from a specific type of program or related projects such as energy or transportation. They are applicable to actions that can be characterized as one large project, that are either (1) geographically related, (2) logical parts of a chain of contemplated actions, or (3) similar actions subject to the same permitting authority with similar environmental effects and subject to the same kinds of mitigation.

A program level EIR can ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis and allow the lead agency to consider broad policy alternatives and programwide mitigation measures early in the process when the agency has greater flexibility.

Use of program level EIRs may also reduce the environmental review necessary for later project specific EIRs or may even eliminate the need for an EIR altogether, allowing use of a negative declaration or even a categorical exemption to address project specifics. However, CEQA Guidelines provide that where subsequent activities involve site specific operations, the agency should use a written checklist or similar method to document the site evaluation and its consistency with the program EIR. Program level EIRs do not require a list of specific projects that will be accomplished under the program.

Master EIRs (MEIRs) may be prepared for a phased project with smaller individual components as well as for general policy or multiphase projects, such as a general plan, specific plan, redevelopment plan, development agreement, state highway or mass transit project, or regional transportation plan. MElRs may be prepared for general plan energy elements, specific plans that include energy facilities, or a large energy project consisting of smaller individual facilities being phased in over time. A master EIR must include

sufficient information about anticipated projects within its scope, such as size, location, intensity, and scheduling. It must also preliminarily describe potential impacts of those projects for which insufficient information is available to support a full impact assessment. It is intended to streamline the environmental review of individual activities included in its overall analysis.

The lead agency and responsible agencies identified in the MEIR may use the MEIR to limit review of subsequent projects. In contrast to PEIRs, MEIRs always require an initial study to determine whether the subsequent project and any significant environmental effects were included in the MEIR. If the agency finds the subsequent project will have no additional significant environmental effect, and that no new mitigation measures or alternatives are required, it does not have to prepare a new environmental document.

In lieu of such a finding, the lead agency must prepare either a mitigated negative declaration or a "focused EIR" for the subsequent project. A focused EIR is another streamlining option that allows jurisdictions to analyze only those additional project-specific environmental effects, mitigations, or alternatives not addressed in a MEIR.

Both PEIRs and MEIRs are recognized under CEQA as appropriate for evaluating the cumulative, growth-inducing, and irreversible significant effects of future energy infrastructure development in a jurisdiction.

A **master environmental assessment (MEA)** is another tool a jurisdiction can use to identify and organize the environmental characteristics and constraints of an area. It can be used to influence the design and location of individual energy facility projects and can provide information that can be used to determine whether specific environmental effects are likely to occur and whether they will be significant.

An MEA can provide a central source of current information for use in preparing individual EIRs and negative declarations. An MEA can also assist in identifying long-range, areawide, and cumulative impacts of individual projects.

MEA in the City of Lancaster

The city of Lancaster prepared an MEA for its General Plan 2030 update. The energy element of the MEA analyzes the city's current energy supply, future consumption, and the factors that contribute to these outcomes. The energy element of the MEA consists of existing transmission ROW locations.

The locations of existing high-voltage transmission lines are identified along with the locations of existing corridors. The locations of regional and neighborhood substations are also listed along with the general locations of underground electrical lines.

Computerized Resources

There are a number of tools that can aid when performing location suitability analyses:

Computerized geographic information systems (GIS) are a valuable method for guiding facility development. GIS surveys of a jurisdiction can assist in identifying suitable facility locations and allow efficient comparison of numerous suitability criteria over large geographic areas. Such surveys can inform communities and developers about areas with significant environmental constraints or conflicting land uses, versus locations that are relatively compatible with future energy facilities.

Planning for Community Energy, Environmental, and Economic Stability (PLACE^{3}S). PLACE^{3}S, an acronym for PLAnning for Community Energy, Economic and Environmental Sustainability, is an innovative planning method that fully integrates focused public participation, community development and design, and GIS tools to help communities produce plans that retain dollars in the local economy, save energy, attract jobs and development, reduce pollution and traffic congestion, and conserve open space.

PLACE^{3}S creates an information base that functions as a common yardstick, empowering a community to compare components of each plan "apples-to-apples," make informed trade-offs, and arrive at a consensus smart growth plan. This process should result in a plan that will be broadly supported, economically and environmentally realistic, make investment sense, and encourage smart growth benefits to be tracked and reported annually.

Energy use and its effects are an effective organizing principle for regional and community smart growth planning. Comprehensive resource efficiency plans simultaneously accomplish other community goals, including affordable housing, increased travel options, reduced traffic congestion, improved air quality, lower infrastructure costs, open space and agricultural land preservation, increased personal and business incomes, and job creation and retention. By advancing community understanding of smart growth linkages, PLACE^{3}S opens doors for implementing a variety of state programs at the local level.

PLACE^{3}S was designed specifically for local and regional governments. The method functions within normal planning operations via a familiar five-step process. Broad stakeholder involvement and quantification of demographic, economic, and environmental effects are important components of each step.

Planning Alternative Corridors for Transmission Lines (PACT). A stakeholder process has developed the Planning Alternative Corridors for Transmission Lines (PACT) decision model. Key stakeholders include:

Agencies. Energy Commission, CPUC, USFS, BLM, Native American Heritage Commission, San Francisco Bay Conservation and Development Commission, U.S. Department of Defense.

Utilities. Los Angeles Department of Water & Power, PG&E, SMUD, SDG&E, San Francisco Public Utilities Commission, SCE, Western Area Power Administration.

Other Groups Represented. California Farm Bureau Federation, California Independent System Operator, California Institute for Energy and the Environment, Energy Policy Initiatives Center, League of California Cities, League of Women Voters, Regional Council of Rural Counties, and So Cal Association of Governments.

The main objectives of the PACT project are to:

- Develop a decision framework to assess alternative transmission line routes.
- Provide objective, consistent, and comprehensive analysis.
- Ensure transparency in methods, databases, and assumptions.

To meet these objectives, an interactive Web-based tool was developed for the siting and assessment of future transmission line corridors and their possible alternatives. The assessments are based on environmental sensitivities, community concerns, public health and safety, engineering feasibility, and economic considerations.

The database can be used to:

- Find feasible routes.
- Screen alternative routes to meet the project purpose and need.
- Evaluate alternative routes from different perspectives.
- Choose preferred and alternate routes.
- Document environmental assessment results.
- Communicate with management, regulatory agencies, and other interested stakeholders.

By facilitating the identification of viable transmission corridors, PACT is intended to provide both the public and decision-makers with an understanding of how these corridors and their alternatives are selected and what the trade-offs are in a consistent, objective, and comprehensive manner. It is also intended to help stakeholders understand the implications of route selection and provide a means for decision-makers to justify and defend their decisions.

How to Improve Public Involvement in Facility Planning

Building public acceptance of energy facilities is an important challenge for government at all levels. Although they are indispensable to communities, energy facilities are often unwanted locally because of legitimate citizen concerns over aesthetics, land use compatibilities, public health and safety, impacts to natural and cultural resources, and environmental justice. These concerns make it increasingly difficult to install needed projects in a timely, efficient, and economical manner.

A major benefit of local planning is the opportunity it creates to reduce these barriers through public education and involvement in advance of actual facility permitting and development. If the public is involved in long-range planning that

recognizes the necessity and benefits of reliable energy supplies, as well as local efforts to maximize the efficient use of energy, it will likely be more accepting of facilities when and where they are eventually needed.

An effective public involvement program will have the following characteristics:

Inclusion of all stakeholders. It is important for all segments of the stakeholder population to participate in the energy facility planning process so they can share consistent information and establish dialogue among disparate groups. In addition to local electric and natural gas utilities and the general public, outreach efforts should also involve local elected officials, independent energy industry representatives, environmental interest groups, and relevant regulatory agencies. An effective method of involving these stakeholders is through appointment to a special energy facility planning advisory committee or task force where they can contribute valuable technical input to the planning process and serve as a sounding board for proposed local policies and standards.

Environmental justice is an important consideration in planning and permitting energy infrastructure. (See sidebar.) Outreach to affected parties should be particularly emphasized.

Developer involvement in the public planning process. As discussed, an important part of a local energy facility plan is the guidance it gives developers before they prepare specific projects. One component of a local plan can be guidelines for developer participation in public activities during facility permitting process. Such guidelines can encourage developer presence at local meetings, provide for convenient access to proposal documentation, and improve responses from developers to public questions and comments. The existence of such direction will help build public confidence in the planning process and consensus about energy facility issues.

Information sharing and public outreach. The information base described previously should be widely and thoroughly disseminated, and the public should be invited to help expand and refine the information. Facility planning processes should be publicized at their outset and outreach efforts made to all stakeholders. Publicity should clearly describe the planning process, location, and availability of planning data, and specific opportunities for public input. In addition to meetings and printed material, information can be shared electronically through dedicated Web pages or similar Web locations. Coverage of public meetings on local community television is also an option in some areas.

Consider Environmental Justice Issues When Permitting Facilities

California was one of the first states in the nation to pass legislation to codify environmental justice in state statute. Environmental Justice is defined in statute as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations and policies." (Government Code Section 65040.12).

The Energy Commission has been integrating environmental justice into its siting process since 1995, as part of its thorough CEQA analysis of applications for siting power plants and related facilities. The cornerstone of the Energy Commission approach is based on wide-reaching public outreach efforts to notify, inform, and involve community members, including non-English-speaking people.

This comprehensive method to identifying and addressing environmental justice (EJ) concerns requires the early involvement of affected communities and other stakeholders. Additionally, approaches to effectively address EJ issues require partnership and coordination. Most significantly, in efforts to pool all available knowledge and bring it into the process, the Public Adviser focuses outreach in power plant siting cases to involve local, affected community members and stakeholders with a background and understanding of a particular area.

Those who live with the outcome of environmental decisions—state, Tribal, and local governments; environmental groups; business; community residents—must have every opportunity to engage in public participation in the making of those decisions. An informed and involved community is a necessary and integral part of the process to protect the environment.

Formal informational events. Because of the technical, environmental, and regulatory complexities of energy facilities, it may be useful to formalize public involvement at special educational workshops, meetings, and events such as site visits to potentially desirable locations or tours of exemplary facilities already sited and operating or under construction. Presentations by local governments that have successfully completed the facility planning process or permitted energy generation or transmission line infrastructure may also be helpful.

Informal collaboration. An important adjunct to formal events can be informal, non-judicial forums of collaborative "brain-storming" among developers, citizens, and regulators. Using the architectural technique of a design "charette," energy facility stakeholders can jointly develop preliminary facility siting and performance ideas for consideration in the more formal processes.

Ongoing activities. Public involvement needs to be an ongoing process that periodically examines current events and monitors the need for revision or fine tuning of established plans. The stakeholder's advisory group mentioned earlier can be reconvened annually or as necessary to re-examine the local energy plan and recommend appropriate updating where warranted.

Information Resources

Multiple resources are available to local governments to assist in energy facility planning. Resources range from staff expertise in other agencies to national laboratories. Major information sources include the following key resources:

- Utilities and independent power producers
- California Energy Commission
- Other state and federal agencies
- Local governments
- University research centers
- Energy industry trade groups

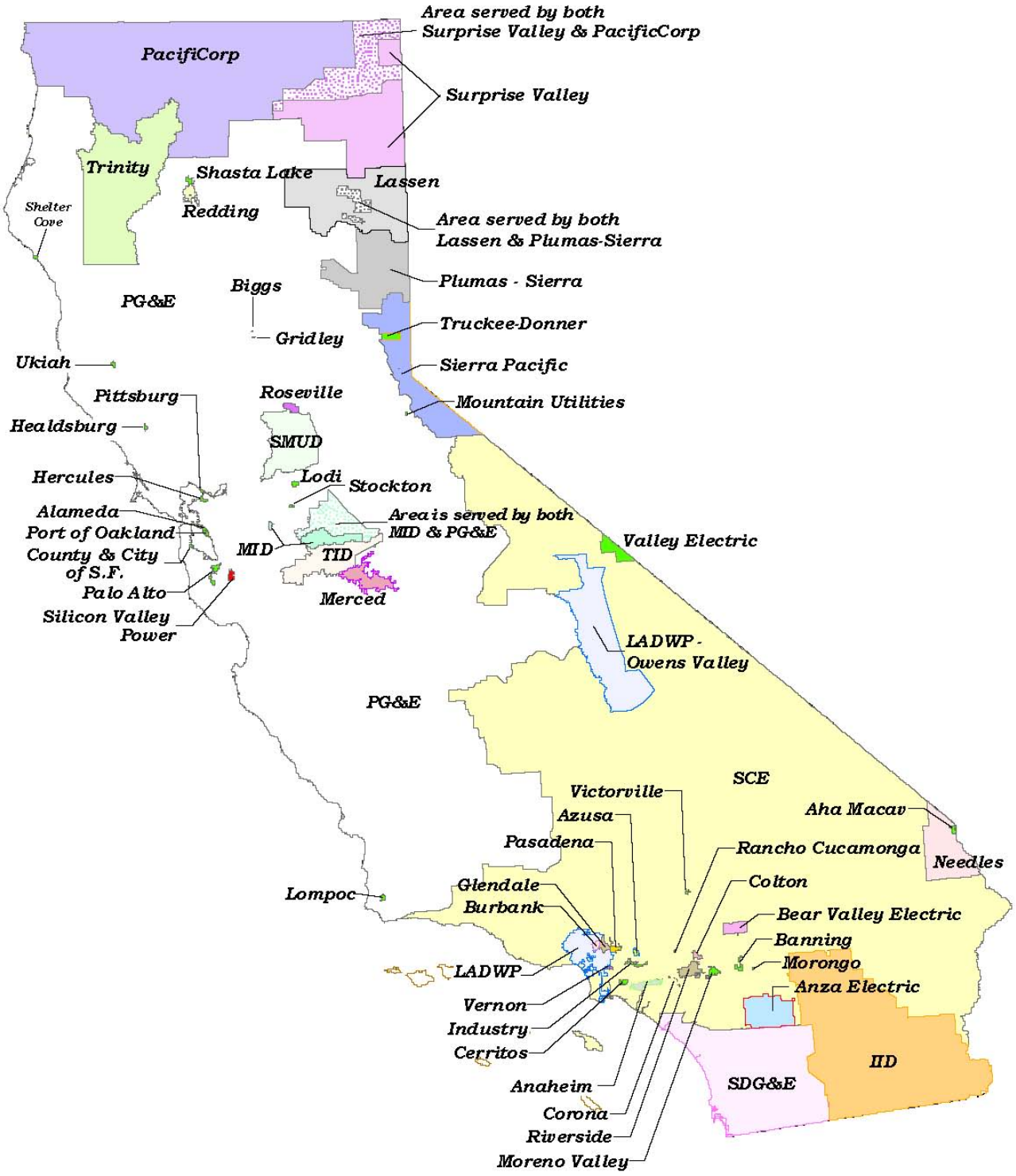
Utilities and independent power producers. One of the best information sources for local agencies are electric and/or natural gas utilities that serve a planning area, as well as independent power producers who may have local plants. All California electric and natural gas utilities maintain service territory plans for their generation and distribution systems. These plans are essential information baselines for any local planning effort, since they form the backbone of a community's energy system. Utilities will also have useful data on future energy demands; available conservation and efficiency improvement opportunities; electric and magnetic field (EMF) management (See Chapter 7.); and the feasibility of employing new, innovative technologies in their service area. Figure 6.1 shows the state's IOUs and POUs that deliver electricity to customers.

California Energy Commission. The Energy Commission can provide information for energy technologies, electricity and fuels use and forecasts, energy facility siting and generating efficiency, and environmental assessments. In particular, local agency Siting and Permit Assistance Program staff can provide additional sources of area-specific information and advice. The Energy Commission has an extensive user-friendly website that provides both general information and dedicated Web pages for facility applications that are underway.

Other state and federal agencies. Several other state and federal agencies have technical staff and publications relevant to local energy resources and facility planning and development, including:

- Governor's Office of Planning and Research.
- California Public Utilities Commission.
- California Department of Conservation – Division of Oil, Gas and Geothermal.
- California Environmental Protection Agency.
- Department of Forestry.
- Department of Water Resources.
- Air Resources Board.
- California Department of Resources, Recycling and Recovery.

Figure 6.1: California's Electrical Utility Service Areas



Source: California Energy Commission

At the federal level, the U.S. Departments of Interior and Energy, U.S. Environmental Protection Agency, and the national laboratories have technical assistance programs and publications that address resources, technologies, and impacts.

Local governments. The informal network of local jurisdictions that have already prepared energy-related plans can also be an efficient and relevant source of assistance. Counterparts in other communities can often identify likely issues and effective methods for addressing and resolving them.

University research centers. California universities and associated national laboratories offer a large array of research and analytical capabilities that communities can use in compiling and evaluating technical planning information.

Energy industry trade groups. The energy industry is represented at state and national levels by several trade groups that can provide useful information on technologies and industry trends. Examples include:

- American Wind Energy Association
- Biomass Processors Association
- California Gas Producers Association
- California Municipal Utilities Association
- California Solar Energy Industries Association
- Electric Power Research Institute
- Geothermal Resources Council
- Independent Energy Producers Association

Assistance is also available in the form of periodicals, research studies, and conference proceedings. Many energy conferences are annual events that local staff can plan on attending for regular up-dates. The Internet has widespread online availability of information and relevant examples regarding energy infrastructure and planning for counties and cities.

Local Involvement in Energy Infrastructure Permitting

The first part of this chapter discusses local government energy planning. The remainder of this chapter discusses local government permitting of energy infrastructure.

As described in the previous chapters, the nature of how electricity is generated and transmitted is changing rapidly. New energy projects are being proposed in local communities, closer to the point of use. Transmission lines traversing new land areas may be needed to bring wind and solar-generated power from remote locations. These developments increase the permitting challenges faced by local governments. This section provides information to make the permitting process more efficient and effective and guidance for obtaining results that reflect input from the community and all other interested parties.

Growing Energy Demands and Local Roles in Permitting

Whether your local government promotes new growth and development or discourages it, increasing growth in California means that your community may need additional energy resources or be affected by the demand for them in other areas. The Energy Commission in its 2009 *IEPR* identified that demand for electricity in California will grow by roughly 1.2 percent annually from 2010 to 2018 (298,545 MW to 345,566 MW), with peak demand growing an average of 1.3 percent annually over the same period (62,946 MW to 73,738 MW).

New energy infrastructure is also essential if the State is going to reach its mandated goal of 33 percent reduction of GHGs by 2020.

New renewable energy infrastructure, power plants, transmission lines, pipelines, and other energy facilities will be necessary to address GHG reductions, the growing demand for electricity, the retirement of old facilities and the refurbishment of existing facilities, and to reduce environmental impacts. Efforts by communities to increase the local use of renewable energy and initiatives like the California Solar Initiative, Go Solar California and Zero Net Energy mean that small-scale solar and other renewable permit applications will significantly increase in the future. Local governments are and will continue to play a major role in permitting these new facilities.

Local agencies may also find that their permitting processes or ability to effectively participate in other agencies' processes will play an important role in ensuring energy facilities are built with the interests of their community in mind. In light of this potential role, the following suggestions are offered:

Realize planning is vital to an effective permitting process. The community planning documents, such as the previously described general plan, community plans, specific plans, and the zoning codes that define them, are the foundation of a local agency's permitting process. The permitting process is one of the ways that local plans are implemented. Effective and comprehensive permitting processes:

- Provide for early public involvement.
- Clearly define permit-related issues.
- Minimize delays and costs.
- Facilitate coordination with developers, utilities, other governmental agencies (federal, state, regional), and interest groups.
- Result in reasonable, enforceable mitigation measures and conditions of approval.

A well-designed process will permit economical, reliable, safe, and environmentally sound energy facilities in a timely manner. Developing clear, comprehensive energy facility permitting processes that effectively reduce time requirements, cost, and contentiousness can be a valuable endeavor.

San Bernardino Permitting

San Bernardino County is an example of active local involvement in permitting. In 2008, the county and the Bureau of Land Management (BLM) entered into a memorandum of understanding (MOU) to make sure the county and BLM work cooperatively in the environmental review process and public participation for renewable projects proposed in desert areas within the county.

As of January 2008, the Community Development Department had received more than 80 solar energy applications and more than 60 wind energy applications, most on federal lands. (The county has jurisdiction if the projects include private land or require county permits.) The MOU provides the county with a major seat at the permitting table.

San Bernardino County also aided BLM in developing the West Mojave Plan (WEMO or Plan) that focuses on the conservation of 9 million acres in the West Mojave Desert. The WEMO was created to establish a conservation plan in the wake of immense renewable energy development as well as a method of streamlining the endangered species permitting process. A local government habitat conservation plan (HCP) is required to carry out the plan on private lands in the West Mojave. In September 2008, San Bernardino County, in union with Kern, Inyo, and Los Angeles counties and 11 desert cities, completed a draft HCP for the local government portion of the West Mojave Plan.

Exert your influence in federal and state permitting processes. Where federal, state, or municipal utilities are the lead permitting agency, local agencies can influence these processes by:

- Knowing and understanding their legal authority and limitations.
- Participating as early as possible.
- Adopting plans, policies, ordinances and standards that identify resources of interest and criteria for development.
- Staying informed about plans for future energy facilities.
- Developing and maintaining cooperative relationships with utilities, governmental agencies, and other energy-related organizations.
- Locating and using available resources and assistance.

An example of active local government involvement in energy planning is San Bernardino County's memorandum of understanding with the BLM regarding new energy applications received on federal land in the county (See sidebar.)

Understand the needs of developers and the public. Developers and the public often find permitting processes very slow, complicated, costly, and without clearly specified criteria or requirements. Lack of agency coordination, inconsistency among agency requirements, and obstacles to public involvement complicate energy infrastructure permitting processes.

Developers and the public prefer clear permit requirements and a logical, predictable process. Developers seek some assurance that their projects will be approved if they satisfy all permit requirements and criteria. The public desires a forum to voice concerns and have issues addressed.

How to Improve the Local Government Energy Facility Permitting Process

Four general areas of the energy facility permitting process in which local governments can make changes to improve and shorten the process are:

- Energy facility **developer guidance** can include policies, standards, and siting criteria; information on the roles of affected agencies; and public information manuals, with legal and procedural requirements.
- **Permit streamlining techniques** by including pre-application packages and meetings, one-stop permitting "shops," use of MEAs and program level EIRs, and an "ombudsperson" to resolve conflicts.
- **Interagency coordination** can include joint application review panels, consistent policies among agencies with overlapping jurisdictions, and elimination of duplicate permit approvals where feasible.
- To be effective, **public involvement** must occur early in the permit process and may include the use of technical advisory committees, frequent public workshops, electronic access to project information, and computer simulations.

Developer Guidance

One of the surest and easiest ways to improve the energy infrastructure permitting process is to ensure project developers are given accurate, comprehensive, and timely information on permit requirements, time frames, and costs. The more information the developer has as early in the process as possible, the more complete the application will be. If the developer knows all local, state, and federal requirements before the application is submitted and the project plans are completed, costly revisions and delays are less likely to occur.

Local government guidance in various forms for energy infrastructure can be made available to prospective permit applicants. Even in cases where local authority over a given energy project is limited, local adopted policies and regulations are considered by many of the lead state and federal agencies. Jurisdictions that have not developed such guidance may want to consider doing so.

This information is beneficial to the local community, the developer, and other regulatory agencies. The community can express its preference for type(s) and location(s) of facilities. The developer does not waste time and money on projects that are unlikely to be approved or welcomed. These policies may also reduce the number of discretionary approvals needed later, reducing permitting time.

Screening Criteria and Mitigation Measures. A community can develop CEQA screening criteria for various issues, such as hazardous materials, air quality, and noise. Screening information will alert project developers to specific data needed to determine impacts and appropriate mitigation measures. Advance information to developers will result in more complete applications, greater consistency, and improved review efficiency.

Local governments can provide information on mitigation required for similar projects, as well as mitigation measures they may require for future projects. The REAT Best Management Practices Manual will help developers to design renewable energy projects that minimize environmental impacts and help to accelerate the environmental review of renewable energy projects at local, state, and federal levels. However, CEQA requires that mitigations for specific projects still have to be determined on a case-by-case basis to address actual impacts of each project.

Pertinent siting information. Communities with a data bank or GIS can easily provide developers with pertinent siting information. Information such as the location of sensitive receptors, soil types, species of concern, and sensitive biological areas can help a developer choose a facility site that is more likely to be approved.

Public information manual. A public information manual can include the information recommended above. It can also contain legal and procedural requirements; projected costs and time frames; and roles and responsibilities of other agencies and utilities for energy facility permits. Such a manual will be useful to energy developers before they start the permitting process by reducing the possibility of delays and associated permitting costs. It would also be helpful to those interested in providing input on specific projects or the general permitting process.

Permit Process Streamlining Techniques

Permit streamlining will reduce the time and costs of issuing and obtaining permits. Examples of useful techniques include: one-stop permit centers, pre-application packages and conferences, simplified permit language, one point of contact for all local permits, cross training of staff, the use of MEAs and program-level EIRs and familiarity with energy technology.

One-stop permit centers provide all local government permitting information for multiple local agencies in one place and can reduce the time and frustration associated with the energy facility permitting process. Employees at the center are usually cross-trained regarding the requirements of all local agencies. Ideally, the center contains a shared database so applicants fill out only one application. The information contained in the application can be shared by all agencies represented at the center to eliminate duplication. One-stop permit centers may also provide the required forms and information from and coordination with state, federal, and other local governments.

Providing a single "point of local government contact" for the project developer to work with will reduce the potential confusion and frustration associated with a permit application, particularly when issues or concerns arise. A single contact person can identify and resolve interagency conflicts before dispensing information to a developer, act as an ombudsperson to resolve conflicts between a project developer and local agencies, handle concerns from the public regarding an application, and improve conflict resolution. By working with all departments, the contact person understands the entire local permitting process, all aspects of the project, and the requirements of all agencies.

Cross-train staff. When a single local point of contact is not possible, cities and counties can cross-train staff within each agency to better understand the entire permitting process. Understanding the entire process and the ultimate goals of regulations should help reduce unnecessary conflicts over insignificant details, delays, and requests for information.

Early Consultation. A pre-application conference between the applicant and representatives from all local, regional, state, and federal agencies requiring permits or approvals or those otherwise interested in the project can identify issues early. All interested parties have the opportunity to provide the potential developer with their concerns and requirements. The developer can then design in the requirements from the start without going through costly and time consuming application revisions or re-submittals. Information about the type and number of permits, approximate costs, and length of approval time can be identified and discussed. Interagency conflicts regarding permit conditions can also be identified and resolved.

Clear Requirements. Energy facility permit problems can be caused by the intricate and confusing language of some regulations. Writing regulations clearly will help to eliminate any confusion that currently exists. Certain ordinances and regulations will require precise, technical language to ensure their compliance. When this is the case, a lay person's translation should also be provided.

Understanding Energy Technology. Becoming familiar with energy technology will help reduce the time associated with permitting these projects. When confronted with a new technology or facility type, local government agencies are understandably cautious. Once a local community has experience permitting an energy technology, it will be able to more efficiently focus on key issues and their resolution, making the next application for a similar facility easier.

Interagency Consultation and Coordination

Energy facilities often have complicated issues that require permit approval from many agencies at various government levels. Coordinating permit requirements among the agencies and jurisdictions responsible for energy facility permitting is another way to reduce time and confusion.

Coordination can involve joint review of permit applications; sharing information between agencies and jurisdictions; eliminating inconsistent policies, standards, and duplicative permit approvals; using parallel permit processing; and delegating permit authority. If a state permit for a particular project characteristic protects the local government's concern in the matter, two permits may not be necessary. However, state permits usually preempt local authority, and the elimination of a local permit is usually due to this preemption.

Joint permit application review panels reduce conflict and help ensure complete applications. Pre-application conferences, where the developer and representatives of affected agencies gather to discuss permit requirements, provide the developer with necessary information before completing the application(s) or committing to a project. Regardless of when joint review happens, it coordinates agencies' efforts and lessens potential conflicts. Joint review will also help assure the participation of responsible agencies for compliance monitoring after the facility is in operation.

Cities and counties can develop contacts with other local jurisdictions with previous energy facility siting experience and avoid having to "reinvent the wheel." Jurisdictions may wish to consider forming a regional work group to discuss ideas for developing consistent energy facility permitting processes and/or resolving mutual problems encountered as a result of energy facilities.

Early participation and response to scoping notices and the CEQA notice of preparation significantly increases your ability to influence other agencies and developers. Active participation in other agencies' formal scoping and data gathering workshops is also critical for effectively influencing lead agencies. Participation provides an opportunity for early input regarding local concerns, identified constraints, policies, and preferences. Scoping meetings and workshops are normally scheduled according to the amount of interest shown toward the proposed project. Therefore, your expressed interest at the beginning of the process will provide greater opportunities for input later.

Ensuring consistent policies and standards among agencies that have overlapping jurisdiction will eliminate conflicts between jurisdictions when permits are sought. There may be instances, however, when there is a need for differing requirements. Inconsistencies may also exist with regulations within a single jurisdiction. Local policies, ordinances, regulations, and standards enacted at different times or by different departments may conflict. Local government agencies should review local policies and ordinances and change or eliminate those that are inconsistent with the community's goals and objectives. Cities and counties may also consider consolidating or reorganizing departments and/or their jurisdictional authority to eliminate overlapping requirements.

Parallel processing can speed up the permit approval process. Often when multiple approvals are necessary, the application

must be approved in a specified order. Sequential processing is usually done to avoid unnecessary work. If one department does not approve a permit, there is no reason to have other departments spend time on it. Unfortunately, this often increases the time necessary to obtain a permit. Parallel processing works as long as the application does not change in a way that affects the concerns of other departments and there is good department/agency coordination. This is not the same as combined processing, as each department or agency retains its authority over the project.

Combined processing is often used if there are co-lead agencies and no interagency agreement has designated one "lead agency." (See below.) Cooperative and combined processing can also be used if many departments are reviewing the permit at the same time, most of the approvals can be obtained simultaneously, and only those departments with problems will require alterations and re-submittal. This type of review generally results in a single permit that incorporates the conditions of approval from the various reviewing departments.

The efficiency of the permitting process can also be enhanced by use of interagency agreements when more than one local agency has authority over a permit area. These agreements specify which, and under what circumstances, one of them would become the "lead agency." In such cases, the "responsible" agencies use the environmental documents prepared by the other agency in their permitting processes. The agreement describes performance standards and conditions and criteria the lead agency must use on behalf of the other agencies. Review, approval, and appeal procedures should be clearly defined.

Public Involvement

Public involvement can greatly enhance the energy facility permitting process, provided the participants are well-informed and actively involved throughout the process. The public can provide useful advice and support provided there is a meaningful attempt to understand and resolve local issues. The process should not be seen as just a public education, coercion, or an attempt to kill a project. Identifying goals and stakeholders, holding frequent public workshops, using technical advisory committees, and facilitating communication are ways that local governments can focus and improve public input. See the Chula Vista Power Plant sidebar example of public involvement in energy planning.

Identify goals and stakeholders. Once public involvement goals have been defined, key community leaders, individuals, groups, or organizations that may have an interest in the success or failure of the facility permit should be identified and invited to become part of the process. The stakeholders should be involved as much as possible and kept informed of activities in which they do not participate. It is important for these stakeholders to be provided access to the permit agency, the developer, and supporting project documents.

Frequent public workshops. Public workshops will provide meaningful

opportunities for addressing community issues. Since they are less formal than public hearings, they provide an opportunity to create a dialogue and facilitate important public input and support. Workshops are more effective at addressing public concerns when held early in the permit process when changes are easier to make. Public hearings that come late in the process, after time and energy have been invested in a facility application, and without benefit of outreach throughout the project, can be ineffective.

Citizen and technical advisory committees. Citizen advisory committees, composed of community representatives, can be organized to advise local governments on energy facility issues and serve as public representatives in the rulemaking process of a regulatory agency. Committee members should be integrated into the permitting process, with their concerns and suggestions considered at all stages of the project. They can also be included in the rulemaking process, possibly reducing later conflicts on specific permits. In addition to a citizen advisory committee, local governments may consider integrating a technical advisory committee (TAC) into the permitting process. TACs are usually composed of representatives from local departments and other community agencies with specific expertise or responsibility over the project.

This might include the various city or county departments, such as public works or environmental health; local water and sewer districts; fire department; police or sheriff's department; or parks district. Project review by a TAC, early in the permitting process, can bring a valuable perspective to a project and provide citizens and the permitting agency with a wider range of knowledge and experience.

Chula Vista Experience

This case concerning the permitting process of the Chula Vista Energy Upgrade Project (CVEUP), in San Diego County, is an example of the importance of public involvement. In August, 2007, MMC Energy, Inc., submitted an application for certification (AFC) to construct and operate the CVEUP, a simple cycle electrical 100-megawatt (MW) peaking power plant facility at the site of an existing power plant site. The project was to be located on a 3.8-acre parcel in the city of Chula Vista's Main Street Industrial Corridor and within the city's light industrial zoning district. An emergency peaker was permitted at the site in 2001 but was not constructed. The CVEUP was proposed to augment the existing plant.

Public involvement during the application review was extensive. Almost 50 individuals offered public comment at the prehearing conference and 75 individuals offered public comment at the evidentiary hearing. Chief concerns were:

- Inconsistency with the city's general plan guidelines in the area of environmental justice.
- Siting of a power plant project in an inappropriate location near homes and schools.
- Economic impacts to local businesses.

In June 2009, the Energy Commission voted to deny certification of the proposed CVEUP. The major reasons were:

- The facility would conflict with certain provisions of the city's general plan intended to separate industrial and residential uses.
- The facility would conflict with the city's general plan intent of maintaining the Main Street Corridor as a light industrial district.
- The facility would violate the city's zoning ordinance because the existing zoning designation, limited industrial, is inappropriate for a natural gas-fired electrical generating facility.

Chapter 7: Environmental Impacts of New Facilities

Introduction to Environmental Impacts

Development and operation of energy facilities can have a significant impact on the local, regional, and global environment. Most facilities require approval from various federal, state, and local agencies that seek to limit these environmental impacts. Environmental documentation prepared to comply with CEQA and NEPA can involve lengthy studies that can affect the time frame for permitting new energy facilities. Public hearings are often held to allow agency and community input and identify issues of local concern. Local governments can play a significant role in the environmental review and permitting process, either directly or indirectly. This chapter provides local governments with information on the environmental impacts of energy infrastructure to support their own energy planning and permitting efforts, as well as ways to respond effectively to planning and permitting actions undertaken by others.

Each type of energy facility has its own project-specific environmental impacts, but there are some impacts that are common to the construction and operation of most facilities.

This portion of Chapter 7 provides background on the common environmental impacts of energy facilities, as well as additional impacts associated with specific types of projects. Many potential environmental impacts can be categorized into the following general impact areas:

- Air Quality (including Greenhouse Gas Emissions)
- Water Use and Quality
- Land Use
- Biological and Cultural Resources
- Hazardous and Waste Materials
- Traffic and Transportation
- Visual and Noise
- Health/Safety and Public Services

The latter part of this chapter discusses environmental impacts specific to energy infrastructure type, including:

- Transmission
- Natural Gas
- Nuclear
- Biomass
- Geothermal
- Solar Thermal and Solar Photovoltaic
- Wind
- Small Hydro
- Ocean
- Carbon Capture and Storage

The Energy Commission, CDFG, BLM, and USFWS have prepared a *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects* that provides recommendations to renewable energy developers, and federal, state, local, and Tribal governments for improving the efficiency of the regulatory process in

California and protecting environmental and cultural resources, and human health and safety. Many of these recommendations (which include other environmental areas besides air quality) are applicable to projects located outside the desert as well. This guide is an excellent resource for local governments.

Air Quality

Energy facilities produce air pollutant emissions during both construction and operational phases. For all new energy facilities, the construction phase produces fugitive dust particles from the movement of earth and emissions from diesel-fueled construction equipment. For fossil fuel and other thermal plant facilities, including solar facilities[3], the combustion of fuels and the use of chemicals are major sources of air pollutants. These air pollutant emissions contribute variably to local air quality, global climate change, adverse health impacts, property damage and public nuisance, and damage to agriculture and the environment. Tables 7.1 and 7.2 provide a description of air quality impacts and the regulatory environment for air quality in California.

Emissions

Emissions from power plants and related facilities usually include carbon dioxide (CO_2), nitrogen oxides (NOx), sulfur compounds (SOx, H_2S), volatile organic compounds (VOCs), dust particles 10 microns or less in diameter (PM_{10}), particles 2.5 microns or less in diameter ($PM_{2.5}$) carbon monoxide (CO), and heavy metals. Many of these pollutants are criteria air pollutants, for which the USEPA and/or the ARB have set standards, based on public health, environment, and material damage criteria.

Carbon dioxide is not a criteria pollutant, but the USEPA has proposed including it in the Federal Clean Air Act (November 16, 2009) and there is great pressure to limit this greenhouse gas (GHG) from fossil fuels, such as natural gas and coal. GHG reductions are an important driver for developing renewable energy facilities, which emit little or no GHGs.

Regulatory Environment for Air Quality

The Federal Clean Air Act (1970, amended 1977, 1990) required the adoption of national ambient air quality standards for all areas of the United States. California has enacted its own, more restrictive, Clean Air Act (1988, amended 1992). In California, the USEPA has delegated the authority to implement portions of the Federal Clean Air Act to the ARB, which has authorized local air districts to implement rules for attaining the national and state air quality standards.

The air districts control all non-mobile air pollution sources. (The ARB regulates air pollutants from mobile sources.) Local air districts have responsibility for adopting and enforcing rules and regulations to ensure that they meet state and federal ambient air quality standards. The districts

[3] Many solar thermal plants generate fossil fuel emissions during construction and operations, adversely affecting desert air quality, and warranting mitigation measures.

are free to enact stricter rules and regulations than the state or federal rules and regulations.

The agencies with permit responsibility for energy facilities typically impose mitigation that can include emission controls, dust suppression, and use of cleaner fuels for construction vehicles and equipment. For operation of natural gas facilities, the mitigation may include best available control technologies (BACT) and the use of emission reduction credits to offset emissions of nonattainment criteria pollutants and their precursors.

While local agencies, other than air districts, do not regulate the emissions from energy facilities, they can take steps to avoid or minimize air quality impacts on surrounding areas. Through their zoning laws, cities and counties can influence policy preferences and use permit processes, where energy facilities are located, and how they will operate. (See Chula Vista example presented previously.)

Table 7.1: Air Quality Impacts

Air Pollutant	Resources (from primary use)	Environmental Impact
Carbon Dioxide (CO_2)	Natural gas, biomass, geothermal, coal	GHG, leading cause for global climate change
Nitrogen Oxide NOx (NO, NO_2)	Natural gas, biomass, coal	GHG, ground-level ozone (smog), fine particle pollution, respiratory effects
Sulfur Dioxide SOx (SO2)	(mostly from coal) Natural gas, biomass, geothermal	Respiratory effects, acid rain, smog, plant & water damage
Hydrogen Sulfide (H_2S)	Biomass, geothermal, coal	Toxic and may cause asphyxiation at high concentration. Foul odor & irritant
Volatile Organic Compounds VOCs (CH_4, CFCs, others)	Natural gas, biomass, geothermal, coal	GHG (methane, CH_4), ozone depletion, smog, irritant, dizziness, respiratory effects
Carbon Monoxide (CO)	Natural gas, biomass, coal	Toxic gas, smog, inhibits oxygen in blood, respiratory & cardiovascular effects
Heavy Metals Mercury (Hg), Lead (Pb)	Natural gas, biomass, geothermal, coal	Toxic, numerous health effects (respiratory, organs, nervous system), human and animal poisoning
Fugitive Dust and Particulate Matter (PM_{10} and $PM_{2.5}$)	All resources, including solar (construction and operation)	Respiratory effects, Valley Fever, reduced visibility

Source: Aspen Environmental Group

Table 7.2: Air Quality Regulations

Federal	
US EPA sets national ambient air quality standards and hazardous air pollutant emission standards; identifies Best Available Control Technologies (BACT) for criteria pollutants, Maximum Achievable Control Technologies (MACT) for hazardous air emissions, Lowest Achievable Emissions Rates (LAER), and oversees State programs (Clean Air Act)	Title 42, United States Code, section 7401 et seq.
State	
Global Warming Solutions Act of 2006 requires California to reduce statewide GHG emissions below 1990 levels by 2020.	Assembly Bill 32
New energy facilities in California may not generate more emissions, proportionally, than a standard natural gas-fired power plant.	SB 1368
CEQA guidelines for significant impacts: Violation of any ambient air quality standard, contributes substantially to existing or projected air quality standard violation, or exposes sensitive receptors to substantial pollutant concentrations	Title 14, California Code of Regulations, section 15064 Appendix G (x)
ARB sets ambient air quality standards	Health & Safety Code Section 39606
ARB (with Dept. of Health Services) sets safe exposure limits for toxic air pollutants and identifies Best Available Control Technologies for Toxics (TBACT)	Health & Safety Code Sections 39650-74
California Energy Commission requires identification of offsets in permits	Public Resources Code Section 25523 (d)(2)
Local air district must issue Determination of Compliance for projects subject to Energy Commission siting process; issues Authority to Construct/Authority to Operate for other projects	Title 20, California Code of Regulations, Section 1744.5
Permits prohibited for facilities that prevent or interfere with attainment or maintenance of any applicable air quality standard	Health & Safety Code Sections 42300 & 42301
No net increase in non-attainment pollutants for districts with moderate, serious or severe air pollution, BACT trigger levels for each category	Health & Safety Code Sections 40918, 40919 & 40920
Local	
Nuisance action to abate damages; public nuisance	Civil Procedure Code Section 731
Local air districts have the primary responsibility for control of air pollution from all sources other than emissions from motor vehicles	Health & Safety Code Section 40000
Full disclosure by facilities to local air district of hazardous emissions	Health & Safety Code Section 44340 et seq.

Source: Aspen Environmental Group

Water Use and Water Quality

A significant environmental issue for new energy facilities is water use and water quality. During construction, sediment or contaminated run-off waste can leave the project site or enter surrounding water bodies. Thermal plants may use water to create and cool the steam cycle of their turbines. The water subsequently needs to be replaced as it is lost through evaporation during that use. Solar thermal power plants consume additional water, including what is needed to clean the solar reflective surfaces.

Power plant water consumption can exacerbate California's already strained water supply, especially in dry inland areas. Chapter 3 addresses current state laws and policies regarding use of potable water for power plant cooling. Finding non-potable sources of cooling water may be difficult. Local governments should evaluate whether local sources of reclaimed water used for power plant cooling would conflict with future community needs.

Thermal Pollution

Thermal pollution develops when water used in power plant cooling processes absorbs heat and is released to the atmosphere (closed-cycle cooling) or a water body (open-cycle cooling or once-through cooling). The once-through cooling process is more efficient and relatively inexpensive but has the most significant environmental impact. The released water is often as much as 20 degrees F warmer than the receiving body. The warmer temperature negatively affects native organisms that are adapted to the ambient receiving water. Wastewater from energy facilities can also contaminate shared water resources. Management of this wastewater (containment, disposal, treatment) must be accomplished to avoid adverse affects on the natural habitat and the water supply.

California's two nuclear facilities and many of the state's older natural gas-fired facilities use once-through cooling. These facilities can draw up to 17 billion gallons of water per day from the ocean or bays, resulting in significant impacts from entrainment (drawing marine life through the power plant) and impingement (pinning marine life against the intake screen).

Once-through cooling systems are currently being phased out by the Clean Water Act and California state policy and are not allowed for new facilities. A more detailed discussion of the impacts of once-through cooling and current state plans to reduce once-through cooling is provided in Chapter 3, as well as in the sidebar in this section. Table 7.3 shows energy facilities with potential water impacts.

Table 7.3: Facilities With Potential Water Impacts

Energy Facility Type	Potential Impact
Facilities using water in cooling process	Thermal impact of receiving waters, impact on local water supply
Facilities that handle and store chemicals	Surface and groundwater contamination
Facilities with holding ponds in water treatment	Groundwater and wildlife impacts
Hydroelectric dams	Change in volume, temperature, velocity and turbidity of rivers, and groundwater recharge
Geothermal facilities	Surface and groundwater contamination from arsenic, vanadium, sulfur, heavy metals, and salts in drilling sludge
Solar facilities that clean reflective surfaces	Impact on local water supplies, drainage impacts

Source: Aspen Environmental Group

Regulatory Environment for Water Use and Quality

Water Use

In California, water supply and use are controlled and managed by an intricate system of federal and state laws. Common law principles, constitutional provisions, state and federal statutes, court decisions, and contracts or agreements all govern how water will be allocated, developed, and used within the state.

Federal water jurisdiction generally applies to projects on federal land or where water flows across state lines. Appropriative rights to surface waters within the state are administered by the State Water Resources Control Board (SWRCB) per Resolution No. 2009-0011. Groundwater management in certain areas of the state is administered either by judicial adjudication or an agency with statutory powers. In general, the California Water Code requires the maximum use of wastewater. The Water Code prohibits use of potable water for non-potable uses, including evaporative cooling and other industrial uses, if reclaimed water or other lower quality water supplies are available.

California Water Code Section 10753 (AB 3030 passed in 1992) authorizes local governments to adopt groundwater management plans. In addition, recent court cases have deemed that the public trust doctrine may limit water rights.

Water Quality

The Federal Water Pollution Control Act, or Clean Water Act, provides for the restoration and maintenance of the nation's water quality. It also provides for the elimination of the discharge of pollutants and prohibits the discharge of pollutants in toxic amounts. The act sets forth the National Pollutant Discharge Elimination System Permit Program (NPDES). The

Clean Water Act, Sections 307(b) and 307(c), also sets forth treatment requirements for discharges from publicly owned wastewater treatment plants.

California's Porter-Cologne Water Quality Control Act and the Safe Drinking Water and Toxic Enforcement Act established agencies and standards for controlling the water quality in the state. The federal government has delegated the authority to issue NPDES permits to the state. These are issued by Regional Water Quality Control Boards (RWQCB). The RWQCBs also regulate water quality in the state by issuing discharge requirements for publicly owned wastewater treatment plants, discharges to land, and storm water discharges. These permits ensure that water quality and the environment are protected.

Some of the methods that can be used to mitigate impacts include:

- **Implement a storm water management plan and contain sediment and runoff during project construction and operation**. This is required by the RWQCBs, but local governments may require that these plans be submitted to them for their review and approval.
- **Reuse water**. However, this can have wastewater discharge constraints.
- **Use recycled wastewater or lower quality water**. Reclaimed water from wastewater treatment plants is often available. The reclaimed water can have high mineralization and nutrient enrichment, which require high costs for treatment. Local governments should

Impacts of Once-Through Cooling

In 2005, the Energy Commission published the *Issues and Environmental Impacts Associated With Once-Through Cooling at California's Coastal Power Plants*. California has 21 coastal power plants that use "once-through cooling." This technology passes up to 17 billion gallons of coastal and estuarine water per day through a heat exchanger to cool the power plant water before returning it to the ocean. Recent studies required by the Energy Commission and other state agencies have shown that coastal power plants that use seawater for once-through cooling are contributing to declining fisheries and the degradation of estuaries, bays, and coastal waters.

Impacts are classified as "entrainment," where small organisms (for example, eggs, larvae) are drawn through cooling water intakes and killed as they are cycled through the plant, "impingement," where larger organisms such as fish and marine mammals are pinned against the intake screens and killed, and "thermal impacts," which describes impacts to ecosystems when the warmed water is discharged back to the cooler source water.

Near-shore marine and estuarine waters are nutrient rich, highly productive ecosystems. These waters provide habitat for innumerable phytoplankton, zooplankton, and invertebrates, as well as the eggs and larval stages for near-shore and off-shore fish, shellfish, crabs and lobsters, and the spores for critical marine plant species like kelp. These ecosystems form a critical part of the marine food web for the larger fish and marine mammal species. When near-shore waters are cycled through power plants for cooling, essentially all of the marine organisms are killed.

consider future uses for reclaimed water.

- **Use alternative technology including dry cooling or a combination of wet and dry cooling**. However, this can be less efficient and more expensive.

Land Use

Land use environmental impacts are primarily caused by conversion of land for energy development. This includes the area for the facility itself, storage of fuels and waste, pipelines, and transmission. Each energy facility type has varying degrees of land use impacts, footprints, and effects on the surrounding environment.

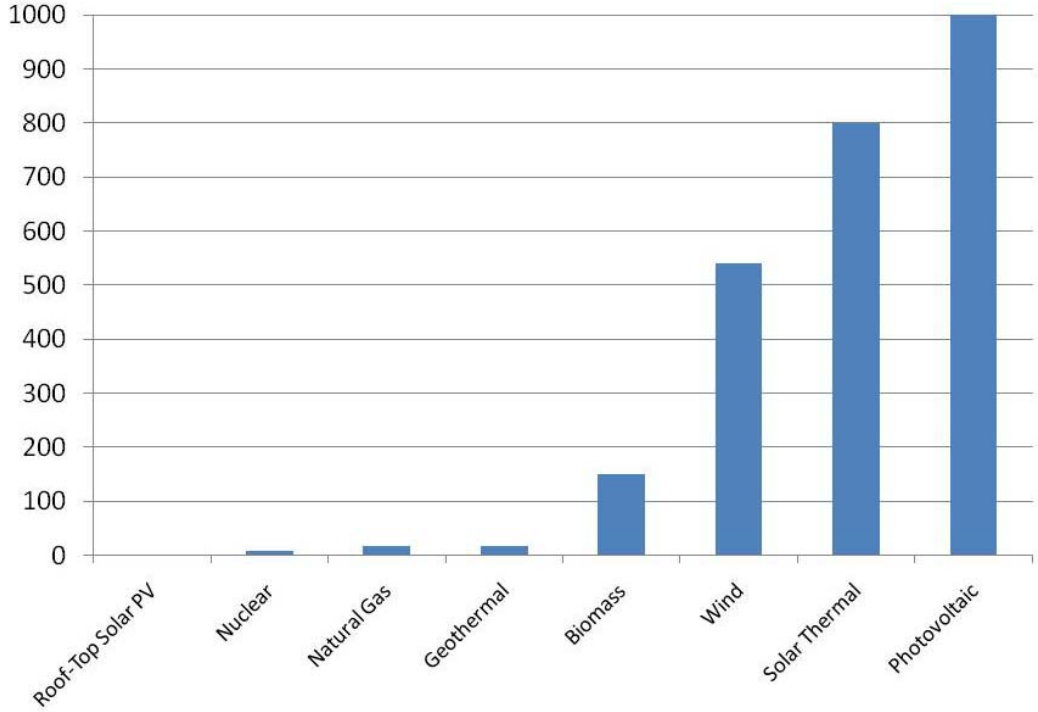
As shown in Figure 7.1, energy facilities may require large tracts of land. Construction of any facility and its supporting infrastructure can physically divide communities, displace agriculture, interfere with existing recreational uses, and influence the direction of future development in the surrounding areas.

As noted elsewhere in this chapter, it can also adversely impact biological, cultural, and visual resources; noise, water, air quality, and waste management. New roads and extensions of utility infrastructure to serve the project can result in increased growth and demands for public services, changes in traffic patterns, and hardships to adjoining property owners.

Land in California is owned by a number of different entities, both public and private. Jurisdiction over the development of those lands varies according to location, ownership, and type of existing or proposed use. A single agency may have exclusive authority over specific lands or projects, or various federal, state, and local jurisdictions may share oversight and develop different management plans for part or all of the land and its resources.

General plans and zoning codes identify uses and constraints to the land under the jurisdiction of local governments. But these lands may also be subject to state or federal permitting requirements or, due to the type of use, may be exempt from those local regulations. Likewise, federal lands may need to take local restrictions into consideration or cooperate with other state or federal agencies. Many renewable energy facilities are proposed to be sited on federally controlled lands but would be supported by county, city, state, or private service providers from outside the federal jurisdiction. Providing services to these facilities may result in greater costs than revenues received from the federal government.

Figure 7.1: Average Amount of Land (in Acres) Used to Produce 100 MW for California Power Plants



* Note: Wind turbines occupy approximately 5 percent of total wind farm land
Source: Adapted from Energy Commission 2007 Environmental Performance Report

Impacts resulting from a change in land use or effects on local communities or property owners are difficult to mitigate, short of moving the project to a different location.

An energy facility is a long-term project, with a projected operational life, in most cases, of at least 30 years. Therefore, conversion of land from its existing use must be considered permanent and unavoidable if the project is approved. Even if the closure plan for the facility requires the land to be returned to its pre-development conditions, the need for that use in that location may have dramatically changed over 30-50 years. In fact, development of the energy facility may have caused or contributed to that change. Other changes, such as population growth, due to the availability of jobs, expansion of services, or improved access, also must be considered permanent and unavoidable.

Local governments may consider off-site replacement or set-asides of land for similar uses (for example, agricultural conservation easements, parks); rerouting or developing new recreational trails or roads to replace loss of existing access; and in-lieu fees for the development of alternative recreational facilities or improvements to existing ones to help mitigate impacts to land use.

A link to maps of land jurisdiction (as well as many other types of maps) is found at: http://library.humboldt.edu/~rls/geospatial/calmaps.htm#land.

Biological Resources

Energy facilities and related facilities, such as service roads, may impact biological resources during construction and operation. (See Table 7.4) These include temporary and permanent effects to animals, plants, and the local habitat.

Construction activities may directly eliminate habitat or individuals of a species, or degrade important habitat as a result of additional noise, soil erosion, and human activity. Bright lights and loud noises can disrupt the habits of animals and interfere with mating and other essential activities. The project site and access roads may block migration corridors or permanently displace local species and natural vegetation.

Facility operational impacts result from air emissions, groundwater drawdown and competing water availability, elimination of habitat, and waste water discharges. Thermal facilities can draw billions of gallons of water for their cooling systems and return warmer water that decreases the level of oxygen available for aquatic life. As discussed previously, aquatic life can be killed directly by being pinned to the inlet or by going through the system itself. Impacts associated with combustion can injure vegetation, damage freshwater lake and stream ecosystems, decrease species diversity and abundance, and create air quality conditions that affect plants and animals.

An example of an impacted sensitive species is the desert tortoise, a state and federally listed threatened species found in the Mojave Desert area of California. Utility-scale solar and wind facilities, both of which require large tracts of land, are increasingly proposed in California desert areas. The very large acreages may not directly threaten the survival of the desert tortoise on an individual project basis, but could pose significant indirect and cumulative impacts to the species when all the projects are viewed together.

Some land is deemed extremely sensitive to disruptors, such as energy infrastructure. Examples of areas of critical environmental concern include:

- Vernal pools, riparian areas, and coastal estuaries because many of these natural communities have already been lost, and they often harbor state and federally listed species.
- Wildlife refuges, ecological reserves, and unique or irreplaceable habitats of scientific or educational value.

Table 7.4: Potential Biological Resource Impacts From Energy Facilities

Energy Facility	Potential Biological Resource Impacts
Wind Turbine Farms	Bird and bat collisions and death, noise and vibration disruption to species, loss of habitat
Large Solar	Loss of habitat, removal of migration corridors
Geothermal	Emissions from scrubbers, waste brine ponds
Forest Waste Biomass	Emissions from trucks, loss of habitat for some species, additional road kills on forest roads
Hydroelectric	Habitat loss and barrier to migration for land and water species, effects of dams on fish migration, fish survival
Transmission	Bird collisions and electrocution of large bird species, loss of habitat

Source: Aspen Environmental Group

Biological Resource Analysis

A biological resources analysis includes an inventory of plant and wildlife species and habitat types at the site, at associated facilities and in the surrounding vicinity. It also includes a description of how an area will be altered, for how long, and its potential effects.

The three primary mitigation choices are avoidance by alternative site selection, on-site mitigation, and off-site mitigation.

Avoidance or alternative site selection usually means locating the energy facility in an area that does not include areas of critical environmental concern or sensitive species habitat but can also mean changing the facility footprint.

On-site mitigation may include employee environmental awareness training, protection of on-site habitats, revegetation with native species, and relocation of sensitive species.

Off-site mitigation usually entails purchase of replacement habitat, when avoidance and/or onsite mitigation is not sufficient. When off-site habitat is directly purchased, an adequate endowment is required to properly manage the replacement habitat in perpetuity. The amount of replacement habitat and the size of the endowment required will vary, depending on the species affected and the specific habitat lost. Compensation ratios depend on the level and severity of environmental impact and can range from a 1 to 1 mitigation to a 5 to 1 mitigation. The latter could require that a 1,000-acre facility obtain and set aside 5,000 acres of land to compensate for its impacts.

Regulatory Environment for Biological Resources

The purpose of the Federal Endangered Species Act of 1973 is to protect biodiversity by providing a program for the conservation of endangered and threatened species and their habitat. California has its own Endangered Species Act that lists species in addition to those on the federal list. Impacts to biological resources must be analyzed under CEQA. Local governments,

through policies and ordinances, may also designate local biological resources of concern if they meet the criteria for "rare," "threatened," or "endangered" under CEQA, even though they are not recognized as such on the state or federal lists. Species of local concern must then be addressed in the CEQA review for a project. Pertinent laws and regulations are listed in Table 7.5 below.

Cultural Resources

Cultural resources can be impacted during construction, operation, and closure of energy facilities, especially for energy facilities that require ground disturbance over large areas. A large number of prehistoric and historic artifacts are present throughout the California desert, and much of this land has not been previously surveyed for cultural resources.

The construction of energy facilities may wholly or partially destroy the majority of the surface archaeological resources in the project area and may wholly or partially destroy other buried archaeological deposits that may be components of project area landforms.

Indirect effects to cultural resources sites in the energy facility area can also occur, especially due to increased traffic during construction and/or visual effects caused by the energy facility. Project area grading could increase the amount of sheet washing and water runoff during heavy rainfall and indirectly cause damage to cultural resource sites outside the energy facility project area.

During operation of an energy facility, addition of a buried utility or other buried infrastructure could require a large hole. Such repairs could impact previously unknown subsurface archaeological resources in areas unaffected by any original excavation.

Table 7.5: Biological Resources Regulations

Federal	
U.S. Fish & Wildlife Service (USFWS) designates and provides protection for species and habitat (Endangered Species Act)	Title 50, Code of Federal Regulations, Section 17.1
Consultation with USFWS is required when listed species may be jeopardized (Fish & Wildlife Coordination Act)	Title 50, Code of Federal Regulations, Section 17
State	
California's Endangered Species Act protects the state's rare, threatened, and endangered species	Fish & Game Code Sections 2050-2098
Consultation and Memorandum of Understanding with Department of Fish & Game is required when rare, threatened, or endangered species may be affected	Fish & Game Code Sections 2081 & 2090
Siting energy facilities in state or local parks, estuaries or areas of critical environmental concern for biological resources is prohibited unless stringent criteria are met	Public Resources Code Section 25527
Local	
Protects species that meet the CEQA Guideline definition of "rare" or "endangered," but are not listed as such by the state or federal government.	Title 14, California Code of Regulations, Section 15380

Source: Aspen Environmental Group

Re-excavation and removal of the energy facility and ancillary facilities could also impact cultural resources.

A cultural resources analysis includes a number of steps. The initial phase is determining the appropriate geographic extent or area of potential effect of the analysis for the energy facility. The second phase is producing an inventory of the cultural resources in each geographic area. Unless resources can be avoided by construction, the third phase is determining whether particular cultural resources in an inventory are historically significant. The fourth phase is assessing the character and the severity of the effects of the facility on the historically significant cultural resources that cannot be avoided in each respective inventory. And the final phase is proposing measures that would resolve significant effects.

The primary mitigation includes consultation, monitoring, mitigation, curation, and reporting activities by a Cultural Resources Specialist. Recommendations must be made regarding the eligibility to the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR) of any cultural resources that are newly discovered or that may be affected in an unanticipated manner.

However, a programmatic agreement (where federal agencies are involved) may also be used for the resolution of adverse effects for complex project situations and when effects on historic properties (resources eligible for or listed in the NRHP) cannot be fully determined prior to approval of an undertaking. The programmatic agreement would govern the continued identification and evaluation of historic properties (eligible for the NRHP) and historical resources (eligible for the CRHR), as well as the resolution of any effects that may result from the construction of the energy facility.

Regulatory Environment for Cultural Resources

A number of federal, state, and local laws and regulations have been enacted to protect cultural resources. Section 106 of the National Historic Preservation Act of 1966, as amended, 16 USC 470(f) requires federal agencies to take into account the effects of a proposed action on cultural resources (historic properties) and afford the Advisory Council on Historic Preservation the opportunity to comment.

The California Office of Historic Preservation refers to the Secretary of Interior's Standards and Guidelines for Archaeological and Historic Preservation in its requirements for selection of qualified personnel and in the mitigation of potential project impacts to cultural resources on public and private lands in California.

The American Indian Religious Freedom Act; Title 42, USC, Section 1996, protects Native American religious practices, ethnic heritage sites, and land uses.

The Native American Graves Protection and Repatriation Act (1990); Title 25, USC Section 3001, et seq., defines "cultural items," "sacred objects," and "objects of cultural patrimony"; establishes an

ownership hierarchy; provides for review; allows excavation of human remains, but stipulates return of the remains according to ownership; sets penalties; calls for inventories; and provides for the return of specified cultural items.

Local governments, through policies, goals, and programs, may also preserve prehistoric and historic resources. Pertinent laws and regulations are listed in Table 7.6.

Hazardous Materials

Accidental release of hazardous materials may occur during the construction, operation, and closure of many types of energy facilities. Although many of the laws regarding management of hazardous materials were promulgated at the federal or state levels of government, it is often local governments that are ultimately responsible for implementing and enforcing such laws. Local governments should be familiar with policies and procedures that ensure proper hazardous materials handling at facilities under their jurisdiction.

Materials are hazardous if they have the potential to cause injury to life and/or damage to property and the environment. Acutely hazardous materials (also called extremely hazardous in federal legislation) can cause serious toxic effects as a result of short exposure periods. Hazardous and acutely hazardous materials possess at least one of the following properties: toxicity, flammability, corrosivity, or reactivity.

Table 7.6: Cultural Resources Regulations

Federal	
Section 106 of the Act requires federal agencies to take into account the effects of a proposed action on cultural resources	National Historic Preservation Act of 1966, as amended
NEPA requires federal agencies to consider potential environmental impacts of the project	Title 42, United States Code Sections 4321 to 4332
Federal Land Policy and Management Act of 1976	Title 43, USC, Section 1701 et seq.
Federal Guidelines for Historic Preservation Projects, Standards and Guidelines for Archaeology and Historic Preservation	Federal Register 44739-44738, 190
State	
CEQA defines significance and includes cultural resources	Public Resources Code Section 15382
Native American Heritage Commission acts as the primary government agency responsible for identifying and cataloging Native American cultural resources	AB 4239, 1976
Requires consultation with the Native American Heritage Commission-identified Most Likely Descendents to consider treatment options.	Public Resources Code 5097.98 (b) and (e)
Local	
Consult with California Native American Tribes about proposed local land use planning decisions	SB 18

Source: Aspen Environmental Group

- Toxic materials have harmful effects on human health or the environment.
- Flammable materials are those that are easily combustible, with a flashpoint equal to or less than 140°F.
- Corrosive materials have a pH less than or equal to 2 or greater than 12.5. They dissolve some materials or burn skin and are toxic if vaporized.
- Reactive materials are those that are unstable or undergo rapid or violent chemical reaction with water or other materials.

Common uses of hazardous materials include fuel burning, emissions control, water treatment, generator cooling, heat transfer, and boiler cleaning. Both the state and federal government have created various lists of hazardous and acutely (or extremely) hazardous materials that define the substances subject to various regulations. The state list of acutely hazardous materials and the federal list of extremely hazardous materials are identical. (See Code of Federal Regulations, Vol 40, Part 355; California Code of Regulations, Title 22, Article 9)

Hazardous materials can be released through a variety of means such as those defined below.

Equipment failure refers to a spontaneous failure without an external event, negligent maintenance, or operation outside designed limits. Equipment failure is rare for new equipment that is designed and maintained to current standards.

External forces that can cause the accidental release of hazardous materials include fires, earthquakes, explosions, and collisions. Facility design and strategic location of hazardous materials can reduce the risk of accidental release due to these causes.

Sabotage can cause the intentional release of hazardous materials. Security measures are incorporated to protect infrastructure from malicious mischief, vandalism, or domestic/foreign terrorist attacks

Human error is the most common cause of accidental release of hazardous materials. Human error may be involved in the design, operation, or management of a facility. The most important factor affecting the potential for human errors is the effectiveness of safety management practices at the facility. A safety management plan for hazardous materials should be required of every facility using hazardous materials. Elements of a safety plan can include:

- Process safety information
- Process hazard analysis
- Operating procedures
- Training
- Pre-start-up safety reviews
- Mechanical integrity
- Hot work permit (such as welding or cutting)
- Incident investigation
- Emergency planning and response
- Injury and illness prevention
- Employee participation

Regulatory Environment for Hazardous Materials

A number of federal, state, and local laws and regulations have been enacted to regulate hazardous materials. Table 7.7 identifies the primary laws that must be adhered to when constructing and operating energy infrastructure. Counties may also include additional guidance in their general plans regarding hazardous materials and guidance on the appropriate locations for projects requiring large amounts of hazardous materials.

Traffic and Transportation

Similar to other infrastructure, energy facilities may impact traffic and transportation. Typically, the major transportation impacts from an energy facility occur during construction, as the number of trips associated with operation of the plant is usually minimal.

Types of impacts would be generally similar across all facility types. Construction vehicles could exacerbate congestion on California highways if they are operating at a level of service (LOS) below LOS C, LOS C has more congestion than LOS B, where ability to pass or change lanes is not always assured. LOS C is the target for urban highways in some places and for rural highways in many places.

At LOS C most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained. Construction trucks may not be able to safely travel on winding roads or roads that are too narrow and alternate routes may be required. Construction and commute traffic for projects in sensitive biological areas could increase mortality of protected species through road kills.

Mitigation measures might include physical improvements (for example, roadway widening, intersection improvements, new transportation signal), trip reduction measures (for example, incentives for employees to carpool or use public transit), or operational changes (for example, schedule changes). Applicants may be required to pay for or restore pavement to its original condition to account for any impacts from truck traffic during construction.

Table 7.7: Hazardous Materials Regulations

Federal	
Establishes U.S. Environmental Protection Agency (EPA) authority and funding mechanisms for cleanup of hazardous waste sites and releases.	Title 42, U.S.C., §9601, et seq. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as *Superfund*
Contains U.S. Department of Transportation (DOT) regulations for transport of hazardous materials.	Title 49, Code of Federal Regulations, 100-185
Contains U.S. EPA provisions for chemical accident prevention, including a list of regulated substances and thresholds.	Title 40, Code of Federal Regulations, Section 68
State	
Describes process safety management of acutely hazardous materials.	California Code of Regulations- Title 8 regulations, Section 5189
Encourages implementation of county-wide unified hazardous waste programs administered by a single agency, and the consolidation of permits into a single permit.	California Senate Bill 1082, passed in 1993 Certified Unified Program Agency
Local	
Requires a description of equipment, an inventory of hazardous materials, and location and use of all hazardous materials at the facility.	Hazardous Materials Business Plan

Source: Aspen Environmental Group

Aviation impacts can occur if a power plant is sited within proximity of an airport facility. Both infrastructure component height and plumes emitted by a facility could affect airspace and aircraft over-flights. Cooling tower thermal plumes and solar thermal "power towers" can be several hundred feet in height. Mitigation may be in the form of Notice to Airmen (Notams) and updating all airspace charts to indicate any plume hazards to aircraft. Solar thermal mirrors may create glint and glare hazards to pilots (and drivers in vehicles).

Information that can be used to determine impacts includes:

- Transportation counts.
- Collision data for study roadways.
- Roadway physical characteristics (for example, number of lanes, median islands, transportation control devices, designation on general plan).
- Parking supply and occupancy.
- Public transit, school buses, and pedestrian and bicycle facilities.
- Airport and site airspace flight data.
- Air plume technical studies.

Major regulations affecting traffic and transportation are provided in Table 7.8. Cities and counties provide relevant standards and guidelines regarding transportation, parking, public transit access, and bicycle/pedestrian facilities through general plan circulation elements, city transportation impact assessment guidelines and county congestion management programs.

Table 7.8: Traffic and Transportation Regulations

Federal	
Establishes standards for determining physical obstructions to navigable airspace and provides for aeronautical studies to determine the effect of physical obstructions to the safe and efficient use of airspace.	Title 14,Code of Federal Regulations , part 77 Objects Affecting Navigable Airspace
State	
Includes procedures and regulations pertaining to interstate and intrastate transport and provides safety measures for motor carriers and motor vehicles that operate on public highways.	CFR, Title 49, Subtitle B 49 CFR Subtitle B
Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways; safe operation of vehicles; and the transportation of hazardous materials.	California Vehicle Code
Includes regulations for the care and protection of state and county highways and provisions for the issuance of written encroachment permits.	California Streets and Highway Code
Encroachment Permits	Caltrans
Local	
Can require maintenance of specified level of service or better on CMP segments.	Congestion Management Plans (CMP)
May identify permitting requirements for oversize/overweight vehicles and need for encroachment permits.	County Codes
Encroachment Permits	County Plans

Source: Aspen Environmental Group

Visual and Noise

The visual and noise impacts of some energy facilities may be regarded as unpleasant or nuisances and are generally treated as such. For energy projects located on remote, undisturbed land, visual impacts may be particularly significant. Noise may disturb some animal habits, including the rearing of young, feeding, and nesting behavior. These adverse effects can shape public opinion negatively and increase opposition toward an energy facility development. Local government planning and permitting efforts will be most successful when project developer, agency coordination, and public involvement are included from the beginning to reduce these impacts.

Visual

Attributes affecting visual impacts include:

- **Visual Quality** is the value of visual resources. In general, human changes to the view in natural areas lower visual quality.
- **Viewer Exposure** depends upon viewer distance from the feature or view, the number of viewers who will see the view, and the length of time the view will be seen.
- **Visibility** describes how easily something can be seen.
- **Viewer Sensitivity** describes the level of interest or concern of potential viewers. Similar existing buildings would lower the viewer sensitivity to new developments.

A project can adversely affect visual character or visual quality by creating contrast with the form, line, color, texture, or spatial arrangement of the existing setting; by introducing a dominant element to a view; by blocking a scenic view; or by causing light or glare. Energy facilities can produce glare (if reflective materials like solar panels or mirrors are used) that can shine on surrounding areas. Nighttime lighting can be directly visible or can illuminate the sky. Utility-scale renewable energy facilities can occupy very large tracts of land and may be inconsistent with the existing scenic qualities of the landscape. A summary of visual impacts by facility is shown below.

- **Wind.** Large tracts of land; highly visible locations (ridges); change from rural to industrial
- **Solar.** Large tracts of land; concentration of sunlight; change from rural to industrial; vegetation removal; scarring; glare
- **Hydroelectric.** Change in river from free-flowing to industrial use; dams are often large; vegetation removal; scarring
- **Geothermal.** Large industrial plants; cooling tower plumes; drilling equipment; pipelines; cooling towers; change from rural to industrial; vegetation removal; scarring
- **Natural Gas.** Combustion facilities visible; high exhaust stacks; emission plumes; visible cooling tower plumes
- **Transmission Lines.** Introduction of industrial element; long, linear facilities with many viewers; impacts to ridgetop skyline

Regulations pertinent to determining visual impacts are shown in Table 7.9.

Table 7.9: Visual Resource Regulations

Federal	
Wild and Scenic Rivers Act protects the visual quality of designated rivers	Title 16, United States Code Section 1271 et seq.
NEPA established the federal basis for addressing aesthetics	Title 42, United States Code Sections 4321 to 4332
BLM Visual Resource Management	Federal Land Policy and Management Act of 1976 and NEPA
USFS Scenery Management System	Multiple Use-Sustained Yield Act of 1960
State	
CEQA defines significance and includes aesthetics	Public Resources Code Section 15382
California Coastal Act protects the scenic and visual qualities of coastal areas as a resource of public importance	Public Resources Code Section 30251
California Scenic Highway System	Streets and Highways Code Section 260 et seq.
Local	
Open Space Element in General Plans	Government Code Section 65302
Zoning and design guideline authority	Government Code Section 65800 et seq.

Source: Aspen Environmental Group

Noise

Noise may be associated with the construction and operation of energy facilities. Potential community impacts

during energy facility construction include speech interference and disruption of daytime activities and nighttime sleep. While construction noise impacts are temporary, operational noise impacts potentially last for the life of the facility. Operational noise levels are rarely allowed to exceed local limits since they could continue day and night for many years. The effects of noise on people can be classified as follows:

- Subjective effects of annoyance, nuisance, and dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

Community noise impacts are almost always in the first two categories, while workers in industrial plants can experience the more physically damaging effects of the last category.

Decibel (dB) is a unit of measurement that describes the magnitude (loudness) of a particular quantity of sound (sound level) with respect to a standard reference value. A-Weighted Sound Level (dBA) is a number representing the sound level that contains a wide range of frequencies weighted in a manner representative of the human ear's response. In general:

- Outside of a laboratory, a 3 dB change is considered a barely noticeable difference.
- A change in sound level of at least 5 dB is required before any noticeable change in community response would be expected.
- A 10 dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response.

Table 7.10: Potential Noise Impacts From Energy Facilities

Facility Types	Potential Noise Impacts
Most facilities during construction	Equipment and delivery noises, pile driving
Facilities with solid fuel delivery (Biomass)	Delivery equipment noises
Biomass	Fuel chipping/grinding
Facilities with pressure release valves (Biomass, Natural Gas, Solar Thermal, Geothermal)	High pitched steam release
Wind	Turbine noises and vibration
Hydroelectric	Turbine noises

Source: Aspen Environmental Group

Table 7.10 shows noise impacts that can emanate from energy facility operation.

Noise impacts can be reduced by muffling equipment, limiting construction and operation times, and relocating project components to increase the distance to receptors.

Local governments can require the project developer to design, implement, and maintain an effective noise-complaint

resolution program during construction and subsequent operation of the energy facility.

The city/county can also require an ambient noise survey and analysis prior to construction and can require noise surveys of the facility and of the surroundings (worker protection and ambient surveys) after the energy facility is operational. If the surveys indicate that either the workers or the community has been significantly impacted, further mitigation can be required.

Pertinent laws and regulations related to noise impacts are listed in Table 7.11.

Health/Safety and Public Services

Health/safety and public service impacts include elements such as the following, many of which are addressed in information presented previously:

- Air emissions from both the construction and operation power plants.
- Accidental releases of hazardous materials.
- Land activities that contaminate soil and water resources, exacerbate flooding, or affect water supply.
- Operations impacts to community services including law enforcement, hospitals, emergency medical services and fire protection.
- Electric and magnetic field (EMF) exposure.
- Transmission line effects on aviation safety, audible noise, fire hazards.

Pertinent laws and regulations related to health and safety impacts that are not addressed in previous tables are listed in Table 7.12.

Table 7.11: Noise Regulations

Federal	
Occupational Safety and Health Act stipulates maximum worker noise exposure levels	Title 29, Code of Federal Regulations, Section 1910 et seq.
State	
California Occupational Safety and Health Administration sets employee noise exposure limits	Title 8, California Code of Regulations, Sections 5096-5098
CEQA guidelines state a project's impacts are significant if it increases substantially ambient noise levels for adjoining areas	Title 14, California Code of Regulations, Sections 15064, Appendix G (p)
Local	
A noise element is required in each local general plan to establish acceptable noise limits for various land uses, usually used to enable policing of annoying noise	Government Code Section 65302

Source: Aspen Environmental Group

Table 7.12: Health and Safety Regulations

Federal	
Requires Maximum Achievable Control Technology for certain levels of Hazardous Air Pollutants (HAPs).	Clean Air Act Section 112 (Title 42, U.S. Code Section 7412)
State	
Establishes thresholds of exposure to carcinogenic substances above which Prop 65 exposure warnings are required.	California Health and Safety Code Section 25249.5 et seq. (Proposition 65)
Prohibits discharges that cause injury, nuisance or endanger the health or safety of the public, or cause injury or damage to business or property.	California Health and Safety Code Section 41700
Air Toxics Hot Spots Program requires inventory and reporting, limits levels of toxic air contaminants	California Health and Safety Code Sections 44300
Requires a quantitative health risk assessment	California Public Resource Code Section 25523(a)

Source: Aspen Environmental Group

New Energy Facilities

This section covers specific environmental impacts of new potential energy facilities in California and is organized by technology type. Relevant regulatory and permitting issues are also discussed. Technologies covered range from conventional energy resources to renewables, each with varying degrees of potential environmental impacts.

Transmission

Transmission lines are high capacity power lines that bring electricity from energy facilities to load centers (cities). Transmission is a critical link for new facilities, especially for renewable facilities, because these sources are often in remote locations, as dictated by quality and availability of the renewable resource and land sufficient to support the generating facility. The availability of existing transmission infrastructure and the feasibility of expanding transmission capacity, including economic viability and environmental impacts, can determine whether an energy project can be developed. There are real and perceived environmental issues that include bird and bat collisions and electrocutions, aesthetics, land use compatibility, fire risk, and electromagnetic field (EMF) effects that may be magnified by the length of the transmission corridor.

Design, construction, and operation of electrical transmission facilities in California are generally outside the regulatory authority of local governments. Depending on the particular facility, this authority may rest with the CPUC, the Energy Commission, or a POU. (See Chapter 5 for more information on the planning and permitting of transmission lines.)

Previous chapters have discussed the process for identifying needed transmission capacity, designating transmission line

corridors, and permitting individual transmission lines. Local governments can develop an order of preference for how and where new transmission corridors are developed, which would then be considered by other agencies responsible for these processes. Preferences might include use of existing lines, upgrade existing lines to meet increased demand, build new lines parallel and adjacent to existing lines, or build new lines requiring new corridors.

Transmission line design characteristics vary depending on the type of structure. Table 7.13 provides an example for one project.

Table 7.13: Transmission Line Design Example

	500 kV	230 kV
Minimum corridor (ft.)	200	150
Single circuit structure height (ft.)	100-150	100-150
Structure base (sq. ft.)	1225-2000	400
Span length (ft.)	1200-1400	700-900
Structure/mile	4-5	7-9

Source: http://www.wapa.gov/transmission/pdf/electricsystemposter_1.pdf

Transmission lines under 100 kV would require a minimum 68-foot ROW.

Figure 7.2: Transmission Towers

Source: Aspen Environmental Group

Air Quality

Operational impacts of transmission on air quality are not significant and occur primarily during maintenance. However, emissions during the construction of transmission infrastructure (towers, substations, and maintenance roads and facilities) may be significant, depending on the length of the transmission line. Construction activities would cause emissions of criteria pollutants, odors, toxic air contaminants, and GHGs but would consist primarily of exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment and fugitive particulate matter (dust) from grading activities and travel on often unpaved surfaces. Exhaust emissions would also occur due to workers commuting to and from project sites and from trucks hauling equipment to the project locations. Because of the length of transmission lines, construction activities may occur at numerous locations at one time.

Water Use and Quality

Transmission does not have significant impacts on water use and quality. Water use is generally limited to dust control. However, the grading and clearing of vegetation during construction can lead to erosion and sedimentation, and water quality can be adversely affected. Best management practices, such as minimizing disturbance to drainage channels, avoiding or spanning watercourses with project structures, and using erosion control methods can minimize impacts to water quality.

Land Use

The land set aside to contain a transmission line is referred to as its "right-of-way." Right-of-way (ROW) corridors for transmission can cover hundreds of miles and traverse many different land areas and uses. In remote areas, the public may be concerned that a new transmission line will affect pristine and undeveloped lands. Transmission lines may be sited on and impact prime agricultural lands. In residential land use areas, public concerns tend to focus on the fear of loss of property values due to the proximity of new transmission lines, safety, and limits to future land uses within and adjacent to the transmission lines. An additional land use issue involves the potential loss of housing as a result of acquisition and removal of residences within the proposed transmission line ROW. Public input and receptivity influences the transmission line development process. Early coordination and planning is paramount to identify the best locations for a transmission line and reduce conflicts.

Biological Resources

Impacts to biological resources from transmission lines occur primarily during construction, but some losses continue once the facilities are operational. Line construction may result in permanent loss of individual listed or sensitive status plant and wildlife species or permanent damage or destruction of their habitat. Construction activities may also result in the temporary degradation of wildlife habitat due to increased noise, human presence, and vehicle traffic; increase the potential for take; and, depending on timing and location, result in the disruption of terrestrial and riparian wildlife corridors. Construction of transmission projects may also introduce non-native plants to the area, which may then threaten native species in the surrounding ecosystem.

During operation, electric transmission lines present an electrocution risk to large aerial perching birds, such as raptors, including those accorded state and/or federal protection. The majority of avian electrocutions are caused by low-voltage transmission lines that are energized at voltage levels between 1- and 60 -kV, which are typically closer to urbanized areas. Collisions generally occur when a transmission line transects a daily or migratory flight path used by a concentration of birds traveling at reduced altitudes. Structures required to span large distances can be 500 feet tall and present a greater risk to migratory birds than shorter

structures; bird mortality is significantly lower at towers shorter than 350 feet. To minimize bird electrocutions, incorporating the "raptor-friendly" construction design guidelines provided in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* is recommended.

Additional concerns regarding transmission lines, especially in the California desert, include increased predation of listed and wildlife species by ravens. Common ravens are known to nest on transmission towers, are opportunistic, and will prey on wildlife species in the vicinity of perching or nesting sites. The slow-moving desert tortoise is particularly at risk.

Hazardous Materials

There are generally no hazardous materials associated with transmission lines, other than a limited quantity of oils and other lubricants and solvents used during construction and maintenance of the line. Implementation of an environmental monitoring program and maintaining emergency spill supplies and equipment minimize risks. Construction of a line may disturb contaminated soils. Agencies overseeing transmission construction stipulate requirements for investigating, containing, and remediating any contamination that is encountered.

Visual and Noise

The public generally considers transmission lines in the landscape to be an aesthetic adverse impact, especially when they are prominent in the views from private residences, public recreational facilities, or major roadways. The facilities are especially controversial where similar features are not already present or where they interfere with scenic vistas. Mitigation measures can include:

- Bury lower-voltage transmission lines.
- Parallel existing lines along an existing right-of-way.
- Avoid ridge tops and upper slopes.
- Locate transmission lines adjacent to the slope in valleys.
- Use existing vegetation to screen or disrupt view of transmission lines.
- Use a curving right-of-way in forested areas to reduce line of sight.
- Follow natural contours.
- Use dull, non-reflective finishes.
- Vary the width of the right-of-way; remove vegetation in an irregular pattern.
- Use transmission structures that minimize visibility.

Additional public concerns exist regarding corona noise. Audible power line noise would be generated from corona discharge, which is usually experienced as a random crackling or hissing sound. The potential for noise from corona discharge is greatest with high-voltage lines during wet weather or near inconsistencies or cuts in the metal surface of the line itself. The precise location of highest possible corona noise cannot be known until after commencing operation. This is because conductor surface defects,

damage, and inconsistencies influence corona. While maintenance of the line can minimize the corona noise, this impact is unavoidable.

Health/Safety and Public Services

Fire Risk

Transmission lines can increase fire risk, particularly in areas where non-native, invasive grasses have replaced natural vegetation. Southern California drought-adapted shrub lands are highly flammable; especially in the fall as fuel moistures reach very low levels. Winds originating from the Great Basin, locally known as *Santa Ana Winds*, create extreme fire weather conditions characterized by low humidity, sustained high-speed winds, and extremely strong gusts.

Fires can be started by transmission lines in the following ways:

- Vegetation contact with conductors
- Exploding hardware such as transformers and capacitors
- Floating or wind-blown debris contact with conductors or insulators
- Conductor-to-conductor contact
- Wood support poles being blown down in high winds
- Dust or dirt on insulators
- Bullet, airplane, and helicopter contact with conductors or support structures
- Other third-party contact, such as Mylar balloons, kites, and wildlife.

Measures to reduce fire risk include preparation and implementation of a weed control plan, development and implementation of a construction fire prevention plan, vegetation management and coordination for emergency fire suppression.

Electromagnetic Field

Both electric and magnetic fields occur naturally and are present around electrical equipment, appliances, and power lines. Electromagnetic field (EMF) has become a very frequently discussed concern, but the human health risks of EMF are still disputed and uncertain.

There are reports of a possible link with cancer in humans exposed to magnetic fields for long periods. Although there is general agreement among scientists that the cancer or other disease-causing potential of magnetic fields has not been established from the available evidence, it is also true that the possibility of such health effects cannot be dismissed by scientists, based on the same evidence.

The challenge for local governments is how to respond reasonably to the concerns of local citizens in the face of scientific uncertainty. Generally, utilities have taken the initiative to inform citizens about the current state of the knowledge on magnetic field issues. Typical magnetic field measurements for appliances and transmission lines are shown in Table 7.14 and Figure 7.3, respectively.

Table 7.14: Typical 60-Hz Magnetic Fields Measured at Various Distances From Some Electrical Appliances- mG

	1 inch	12 inches	36 inches
Microwave Oven	140	65	10
Refrigerator	6	4	1.2
Electric Range	250	25	2
Electric Shaver	500	-	-
Hair Dryer	100	30	-
Electric Can Opener	5000	470	24
Computer Terminal/TV	26	3.4	1.2
Electric Clock	130	15.5	2.5

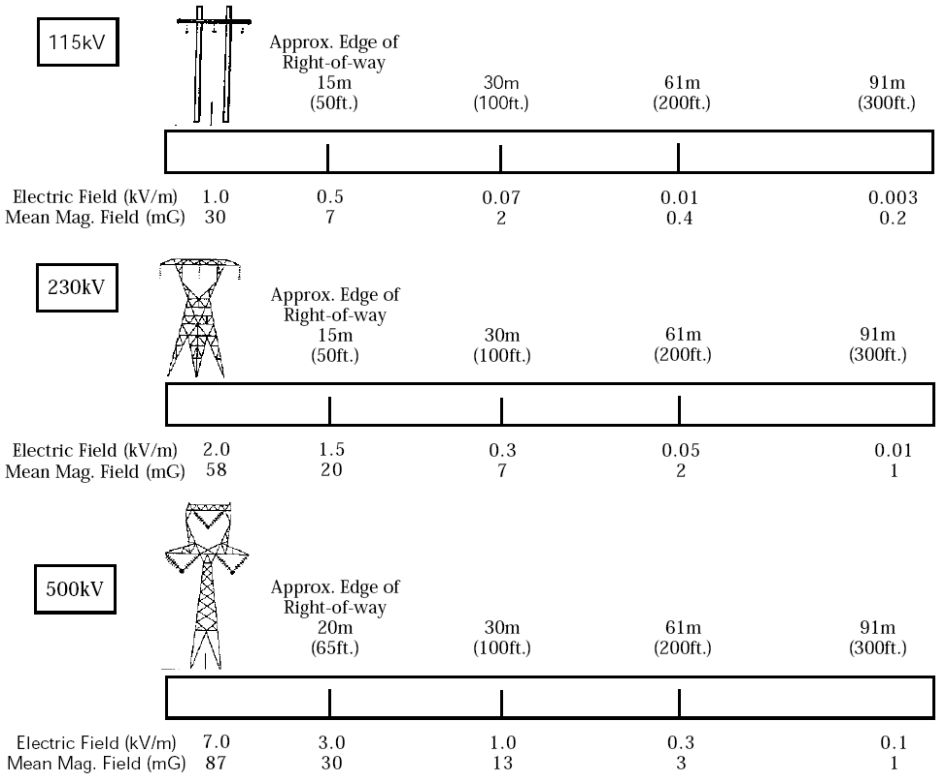
Source: http://www.dukenergy.com/pdfs/emf_brochure.pdf

There are actions that can be taken in transmission facility and switchyard location and design that can reduce potential electric and magnetic fields. Design considerations include changing the structure height, altering the conductor configuration and spacing, and reordering the phase sequence. Early communication and factual treatment of EMF issues can help the public better understand how and whether EMF would affect their community.

The CPUC has implemented a decision (D.93-11-013) that requires that IOUs use "low-cost or no-cost" mitigation measures for facilities requiring certification under General Order 131-D.4 The decision directed the utilities to use a 4 percent benchmark on the low-cost mitigation for EMFs. Although POUs are not under the jurisdiction of the CPUC, these utilities are voluntarily complying with the requirements. The CPUC issued Decision D.06-01-042 in January 2006, affirming the low-cost/no-cost policy to mitigate EMF exposure from new utility transmission and substation projects. This decision also adopted rules and policies to improve utility design guidelines for reducing EMF. Examples of "low-cost or no-cost" mitigation include:

- Locating lines closer to the centerline of the utility corridors.
- Combining existing transmission circuits onto the same structure.
- Arranging phases of different circuits to reduce magnetic fields when multiple circuits are located on the same structure or in the same underground ductbank.
- Keeping electrical equipment as compact as possible, locating high current devices such as transformers, capacitors and reactors away from fence lines.
- Restricting public access to area around transmission lines or substations.

Figure 7.3: Typical Transmission Line Electric and Magnetic Field Strengths



Source: DOE/BP-2081, Electric Power Lines, November 1993.

Natural Gas Power Plants

Natural gas-fired power plants are the most common source of electricity in California, providing more than half of the state's electricity.

Figure 7.4: Moss Landing

Source: Monterey Bay National Marine Sanctuary

Air Quality

Compared to coal, at least 1/3 to 1/2 fewer CO_2 emissions are associated with the burning of natural gas. Technology advances have improved the thermal efficiencies of gas-fired plants. In absolute quantities, however, the combustion of natural gas emits relatively large amounts of GHGs and other criteria pollutants that have been traditionally regulated under the federal and state Clean Air Acts. GHG emissions contribute to the warming of the Earth's atmosphere, leading to climate change. For fossil fuel-fired power plants (including natural gas), the GHG emissions include primarily carbon dioxide, with much smaller amounts of nitrous oxide (N_2O, not NO or NO_2, which are commonly known as NOx or oxides of nitrogen), and methane (CH_4 – often from unburned natural gas). Also included are sulfur hexafluoride (SF_6) from high voltage equipment and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chiller equipment. GHG emissions from the electricity sector are dominated by CO_2 emissions from the carbon-based fuels.

NOx emissions and nitrogen deposits have significant impacts and must have emission controls on natural gas facilities. NOx, SO_2, VOC, and ammonia from natural gas facilities can contribute to the formation of secondary pollutants, ozone and PM10/PM 2.5. Ozone contributes to ground-level smog, which can lead to serious respiratory health effects.

The use of ammonia to control NOx emissions causes nitrogen deposits that can alter the balance of the natural habitat. The excess nitrogen can contaminate groundwater, alter soil chemistry and affect plant and animal life. The transportation and storage of anhydrous ammonia can pose a safety risk without appropriate controls.

In California, natural gas plants often require air emission offsets to mitigate their impacts to air quality. Offsets are in scarce supply in many areas and the use of offsets for power plants has been controversial. The potential availability of offsets is discussed in Chapter 3.

Natural Gas-Fired Power Plant Emissions

Natural Gas-Fired Power Plant Emissions	Significant Impacts
CO_2, NOx, CH_4, CO, VOC, PM_{10}, $PM_{2.5}$, and SO_X	GHGs and climate change, nitrogen deposits on species, heat pollution plumes, smog and visibility

Water Use and Quality

Natural gas-fired power plants can impact water quality via effluent and thermal discharge; spills from fuel transport tankers or pipelines; deposition of nutrients, toxins, and salts from power plant emissions onto soils and into bodies of water; and storm water runoff. Securing a sustainable water source in California's water-strapped environment can be extremely challenging.

To address supply, less water-consumptive cooling technologies are encouraged. For example, closed-cycle systems with cooling towers can be used over once-through cooling, which draw vastly larger amounts of water. Power plants that use once through cooling draw billions of gallons of water per day. Inlet water can trap and kill aquatic life, and the returned wastewater warms ambient temperatures and can decrease the level of usable oxygen in the water. Reclaimed water may be available for power plant use but must be treated to be suitable. Air-cooled systems can also be considered but must be balanced with the loss of efficiency and increased cost. The discussion of the impacts of once-through cooling is provided in Chapter 3.

Inappropriate discharge of power plant cooling wastewater can contaminate surface and groundwater resources and directly affect species in the vicinity of the plant. Accepted disposal methods include discharge into evaporation ponds, local sewer systems, underground injection, or treatment through zero liquid discharge systems.

Land Use

Gas-fired power plants may be located in both urban and rural areas. These plants have a land use profile of about 0.2 acres per MW. While the acreage required for a natural gas plant is much less than for other generation facilities, additional land is needed to provide natural gas and water via pipelines to the plant.

Long-distance pipelines often pass through environmentally sensitive areas, such as wetlands. The construction may require heavy machinery and temporary foundations with large footprints that can permanently alter the landscape and displace local species. Early planning can help avoid some of these issues and can identify paths of least impact. Choosing sites of similar development or building alongside existing pipelines can decrease the magnitude of impacts as well.

Biological Resources

Many of the biological resource impacts occur from the direct combustion of natural gas and the water needs of the cooling system. The vast amounts of water required

for cooling can entrain or entrap aquatic life through the inlet and return warmer wastewater to the source, altering the ambient temperature of local water sources. Nitrogen deposits can alter the chemistry of water and soil, affecting the supply of food and water for animals.

Other impacts include construction-related activities and permanent impacts such as bright lighting and noise that can disturb the local species and displacement of land and vegetation.

Hazardous Materials

Natural gas poses fire and possible explosion risks because of its flammability. However, for most gas-fired facilities, natural gas is not stored on-site, but delivered by a gas pipeline. The gas pipelines must meet CPUC General Order 112 standards and 49 CFR 192 standards for pipelines located in populated areas. Existing laws and regulations minimize the risk of pipeline failure.

Natural gas-fired facilities require fewer emission controls than facilities using high-sulfur fuel, such as coal, but do require significant NOx controls. NOx controls may involve the use of anhydrous ammonia, which is a hazardous material. A release of anhydrous ammonia can pose a significant risk to public health. Non-hazardous urea-based compounds may be substituted for ammonia compounds in some cases.

Chemical wastes from water treatment and effluent water from cooling water system blowdown could cause contamination.

Hydrogen gas cooling is used to dissipate heat from the generator. Special handling is needed during start-up, with air in the chamber first displaced by carbon dioxide before filling with hydrogen, to ensure that the highly flammable hydrogen does not mix with oxygen in the air.

Visual and Noise

Cooling towers and the industrial aesthetics of facilities may be unappealing and can have a moderate sound level increase from operation. Facilities are often located near load centers, increasing the number of visual or noise receptors (people who can see or hear the facility).

Power plants near airports can cause visibility and safety issues with visible and thermal plumes that can impede air traffic.

Health/Safety and Public Services

The principal health and safety issue related to the operation of natural gas-fired facilities is the use of anhydrous ammonia. (See hazardous materials discussion.) Public services are not usually affected by natural gas plants given that the plants are often located in industrial areas with ready access to necessary services.

Nuclear

Nuclear power facilities are thermal plants that use fission, instead of burning fossil fuels, to create heat and make steam. Nuclear power provides roughly 1/6 the electricity in California, although a new facility has not been constructed since the 1970s. This is because California law prohibits the construction of new facilities in the state until the federal government can demonstrate a safe and permanent solution to the disposal of nuclear waste from spent fuel. Plans for the Yucca Mountains storage location have been delayed indefinitely, and federal policy is still evolving and uncertain.

Recently, climate change concerns have revived interest in nuclear power because it does not directly generate CO_2 or GHG emissions. However, nuclear power remains a highly debated and controversial resource, with issues involving national security, high volume water use from once-through-cooling, and cost. Delays play a key role in raising costs, as permitting issues and varying interest groups can impede nuclear facility development. Development costs may also be underestimated, since no new facilities have been built recently, raising the learning curve for design and construction. Most significant, however, is the pending uncertainty relating to the long-term storage of nuclear waste, which can remain radioactive for millions of years.

The Nuclear Regulatory Commission (NRC) regulates all nuclear power plants in the United States. In addition to licensing by the Energy Commission, licensing through the NRC is required for both construction and operation to ensure compliance of NRC regulations. Additionally, utilities must obtain CPUC approval to pursue license renewal before receiving California ratepayer funding to cover the costs of the NRC license renewal process. The CPUC proceedings determine whether it is in the best interest of ratepayers for California's two nuclear plants to continue operating for an additional 20 years. The purpose of the CPUC license renewal review is to consider matters within the state's jurisdiction, including the economic, reliability, and environmental implications of relicensing. Additional information regarding nuclear relicensing is found in Chapter 3.

Figure 7.5: Diablo Canyon Nuclear Power Plant

Source: Sea Grant California

Air Quality

Nuclear power does not directly generate any CO_2 or GHG emissions and has relatively little effect on air quality. As with all generating facilities, construction of nuclear plants would create air emissions.

Water Use and Quality

Nuclear facilities require large amounts of water for cooling. California's two nuclear power plants use once-through-cooling (OTC), each drawing in and releasing 2.5 billion gallons of warm water per day into the ocean. As discussed previously, OTC can kill or impair marine life and alter the natural ecosystem. The SWRCB issued a preliminary proposal concerning reduction of OTC impacts from existing power plants in 2006 that would require compliance dates for the nuclear power plants by 2021. From the perspective of the SWRCB, the nuclear plants in California are the largest source of biologic harm caused by electricity generation.

However, as stated above, nuclear plants create minimal air quality pollutants and do not create GHGs. Additionally, the nuclear units supply a significant percentage of the energy used by California end users, and shutting them down would exacerbate overall electric energy supply and could cause reliability problems. Retrofitting the nuclear plants with alternative cooling systems or replacing their capacity requires special studies, designs, and construction techniques.

Relatively small amounts of primary water are used in direct contact with the nuclear reactor to transfer heat to secondary fluids (not in contact with the reactor). The primary water is considered low-level waste and handled as radioactive materials.

Retrofitting to wet-cooling with cooling towers is a possible option and would substantially lower the amount of water used, but it is less efficient and has a high capital cost. In 2006, the report *Cost and Value of Water Use at Combined-Cycle Power Plants* was published that discusses this trade-off. Future development or retrofits must balance environmental constraints with cost-effectiveness of different technologies.

Land Use

Nuclear facilities have a relatively small footprint at 0.75 acres per MW. However, this does not include indirect land use requirements, such as buffer lands, fuel production, and waste storage. These indirect impacts may be 200 times as large as the generation-only footprint. In addition, land impacts would be much greater in the unlikely event of a radiation release from the plant.

According to the *AB 1632 Assessment of California's Operating Nuclear Plants*, with spent fuel currently held at the power plants sites in dry-casks, the immediate and surrounding land is generally regarded as undesirable and unusable for future activities, such as recreation. This is based on the assumption that spent fuel storage creates health and safety risks that preclude certain types of land uses. However, following the decommissioning of the Rancho Seco nuclear power plant near Sacramento and the Maine Yankee nuclear power plant near Wiscasset, Maine, local communities successfully converted the land once used for the power plant and area immediately around it into recreational or economically productive mixed uses. Even with a plant site converted to alternate uses,

the question remains whether the continued presence of the spent fuel has a negative impact on property values, business, and tourism in the area.

Biological Resources

Nuclear power plants have considerable biological impacts from the entrainment and impingement of aquatic species, and from the discharge of heated water. (See Chapter 3) Construction of the facility itself would directly impact any species of concern within the plant's footprint and indirectly impact species in the region due to increased traffic and discharge.

Hazardous Materials

Nuclear power plants generate high-level radioactive waste from spent fuel and low-level waste from water and other materials in direct contact with the reactor. All the nuclear waste is treated and stored on site indefinitely, with the spent fuel placed in thick-walled concrete dry-casks, effectively preventing any radioactivity from exiting the storage unit. The physical amount of waste is relatively small in size, but the potential impacts are highly dangerous and can remain so for millions of years.

The Yucca Mountain project in Nevada was intended to be a permanent national depository, with deep geological storage and monitoring of all spent fuel nuclear waste in the United States. It has been delayed indefinitely and has considerable technical and policy uncertainty for long-term storage viability. Some of the concerns include the potential for groundwater seepage and seismic activity, and the risks associated with transporting nuclear waste to Nevada.

Visual and Noise

Cooling towers and the industrial aesthetics of facilities may be visually unappealing and can have a moderate sound level increase from operation. The location of future facilities in remote areas would reduce visual or noise impacts. However, receptors are typically located at distances where noise issues are not a concern.

Health/Safety and Public Services

The Three Mile Island incident, which occurred in 1979, is considered the worst nuclear incident in United States history. A partial meltdown of the reactor occurred and small amounts of radioactive gases were released, although no deaths or injuries occurred to workers or in the local community. California's nuclear plants came online in the mid-1980s and have been operating for approximately 25 years. To ensure the safety of aging structures, significant capital investment and monitoring of equipment are needed.

For both existing and potential facilities, ongoing safety concerns include seismic vulnerabilities and terrorist attacks, although there have been no serious incidents along these lines in the United States. The NRC requires multiple measures for licensing to ensure public safety. These include a safety analysis report, environmental impact assessment, and public hearings before construction.

In 1988, the CPUC established the Diablo Canyon Independent Safety Committee,

which is tasked with reviewing and assessing the safety of operations of Diablo Canyon. Committee members conduct meetings twice yearly, visit the plant, and are given extended access to Diablo Canyon reports and records. The committee issues a yearly report on its findings.

Geothermal

Approximately 2/3 of total geothermal energy in the United States is produced in California, which contributes 4 to 5 percent of California's electricity. It is an important renewable resource because it provides a reliable baseline source of power, as opposed to the intermittent power from solar and wind. Geothermal facilities are highly location-specific because they require unique geological conditions, usually near seismically active tectonic plate conjunctions. Figure 7.7 identifies known Geothermal Resource Areas in California.

Geothermal systems use heat from underground geologic sources to produce steam, which is then used to spin turbines and generate electricity. The heat comes from trapped steam or hot water underground and may be used directly to run the turbines, or can transfer the heat to other fluids to produce steam. There are new technologies emerging designed to exploit hot dry rocks which can artificially create steam when fluids are injected underground. The method of heat extraction and heat transfer will directly influence the types of environmental impacts from geothermal facilities.

Air Quality

Air quality impacts from geothermal facilities are relatively low because they do not use combustion to generate electricity so only minimal criteria pollutants, such as NO_x, CO, SO_2, and VOCs, are expected. Geothermal fluids from underground either naturally trapped or from injection, will contain non-condensable gases, although far less than the average U.S. power plant. These include greenhouse gases (CO_2, methane, N_2O, and hydrogen), sulfur dioxide, hydrogen sulfide, and ammonia.

Figure 7.6: The Geysers

Source: USGS

In binary plants, geothermal fluids stay in a closed-loop and the heat is transferred to other fluids. In this case, the geothermal fluids are generally injected back into the ground after heat extraction and do not make contact with the atmosphere. However, in dry steam and flash steam plants that use the steam directly from underground, the facility is an opened-loop system and non-condensable gases are vented to the atmosphere.

The Geysers in California is the largest cluster of geothermal facilities in the state and uses an opened-loop flash steam system. Open-loop systems are more

economical, as they do not require heat transfer and cooling towers, but can have adverse air quality impacts and require scrubbers and solid waste disposal.

Geothermal Emissions

Emissions	Significant Impacts
PM_{10}, H_2S, ammonia, boron and other metals	Strong odor, toxic chemicals, ecosystem damage

Hydrogen sulfide (H_2S) is of particular concern to geothermal projects. It naturally occurs in geothermal fluids, is considered a nuisance odor at low concentrations and is lethal at extremely high concentrations. Hydrogen sulfide is heavier than air and remains in the atmosphere for approximately 18 hours, accumulating in low-lying areas, thus reducing the potential for dissipation over great distances.

Hydrogen sulfide can also convert to sulfur dioxide and sulfuric acid in the atmosphere. Sulfur oxide emissions can injure vegetation, damage freshwater lake and stream ecosystems, decrease species diversity and abundance, and create hazy conditions.

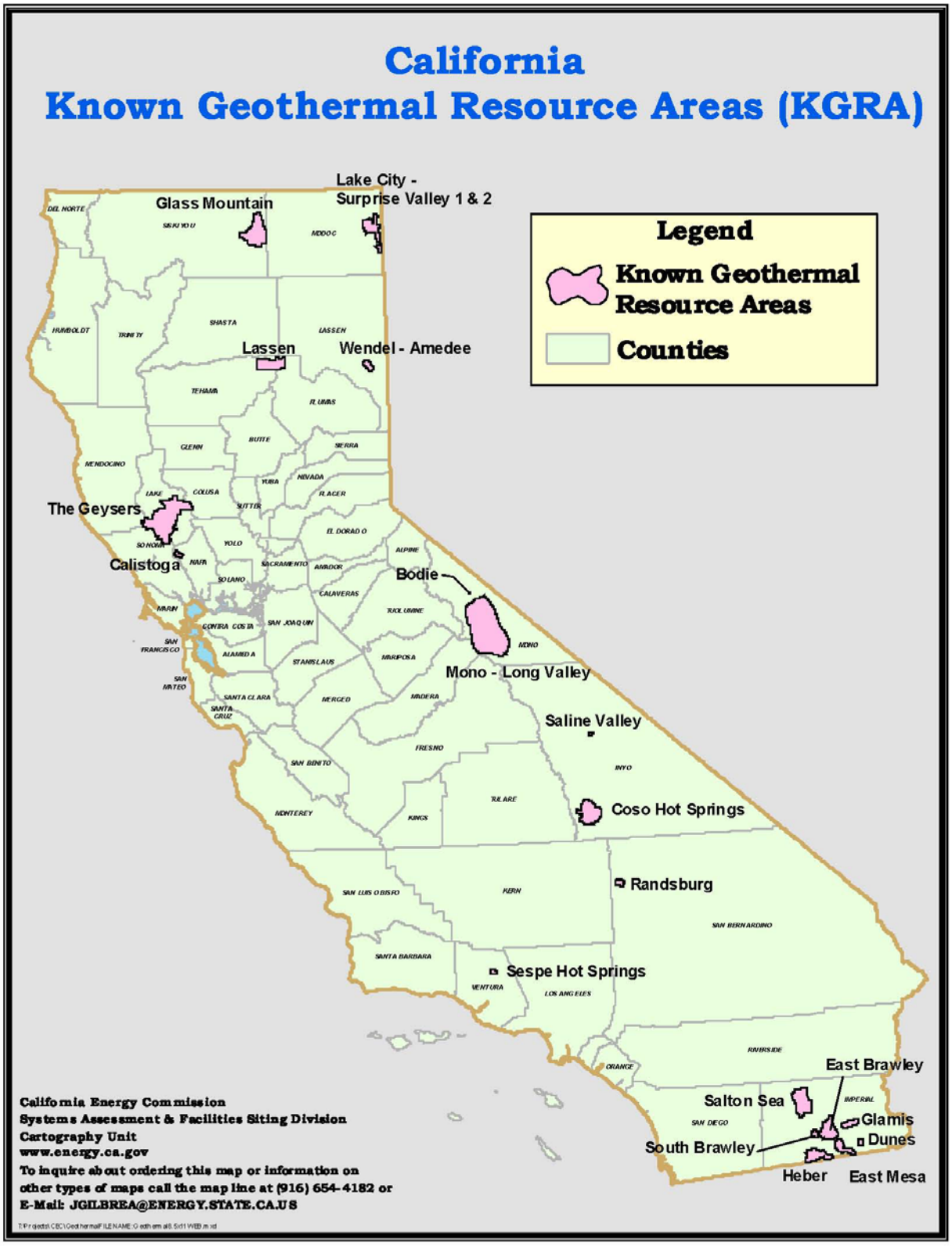
Hydrogen sulfide can be removed from the vent stream with standard abatement technologies by scrubbing or conversion to elemental sulfur, with control efficiencies of H_2S discharge of at least 99 percent. Trace amounts of heavy metals such as mercury, radon, and boron, exist as well in localized sites.

Water Use and Quality

Significant water use and water quality impacts may occur, depending on the type of geothermal system. As mentioned previously, for closed-loop systems, geothermal fluids are usually injected back underground after heat extraction. Cooling towers and large amounts of water are needed for the cooling cycle. If groundwater is the water source, significant drawdown of the groundwater tables may occur. For opened-loop and flash steam systems, geothermal fluids require emissions scrubbing and solid waste disposal to avoid a number of adverse water impacts, such as contaminating aquifers or shared resources.

Use of emissions scrubbers in opened-loop systems produces a watery sludge high in sulfur and vanadium, which can be toxic in high concentrations. The wastewater sludge, known as geothermal brine, contains heavy metals, such as arsenic, lead, copper, and zinc. A costly method of remediation involves drying the sludge and shipping it to hazardous waste sites. The preferred method is to reinject geothermal fluids back underground to stabilize the geo-pressure and avoid land subsidence, which can lower the elevation of the ground surface, cause ground cracking and negatively affect the capacity of the groundwater aquifer.

Figure 7.7: California's Known Geothermal Resources Areas



Source: California Energy Commission

During upset conditions, such as loss of solids removal capability, the spent geothermal fluids from flash systems are typically pumped to brine ponds. Because the geothermal fluid is extremely high in total dissolved solids, a release into the local ground water aquifers could significantly impact local groundwater quality.

Impacts to groundwater could also occur if there was an accidental release of geothermal fluids into the groundwater aquifer. Accidental release of fluid from the geothermal reservoir during drilling or injection is rare, due to the depth of the geothermal resource (for example, below the shallow groundwater aquifer) and the use of sufficiently thick competent casings.

Land Use

Geothermal facilities have a relatively moderate land use footprint with an average of 0.2 acres required per MW for the generation site. However, extensive geothermal well fields may be required to provide adequate steam. The plant must be built on or near a geothermal reservoir, typically in seismically active zones and often on previously undisturbed land. The construction of geothermal facilities may be significant as drilling deep wells to access heat sources may disturb land and sensitive species. Once operational, however, the well pad covers only about 2 percent of the area of the well field, and regrowth and revegetation can partially offset vegetation cleared for plant installation. Ongoing land use issues relate to possible geothermal fluid leaks and spills that can impact soils surrounding the pipelines.

Subsidence can occur naturally or through the extraction of subsurface fluids, including geothermal fluids. Subsidence can be reduced through injection of spent geothermal fluids into the underground reservoir. Injection is regulated by the U.S. EPA to adhere to requirements of the Underground Injection Control Program.

Seismicity

Active seismicity and subsidence generally occur in areas with high levels of tectonic activity (for example, volcanic regions, fault zones), which are the same areas in which geothermal resources occur; therefore, it is difficult to discern between power plant-induced and naturally occurring seismicity and subsidence.

Drilling deep into the Earth's crust to access high-temperature geothermal resources and subsequent reinjection of fluid into the geothermal reservoir may result in micro-earthquakes, which are below magnitude 2-3 on the Richter scale. These micro-earthquakes are typically centered on the injection site and are too low to be noticed by humans. However, the Geopower Deep Heat Mining project in Basel, Switzerland, (an area of high earthquake activity) did cause multiple micro-earthquakes in 2007 that were experienced widely. The project was the first commercial application of the hot fractured rock technique, which allows recovery of heat from dry rock.

Biological Resources

Geothermal fluids contain hydrogen sulfide, which can also convert to sulfur dioxide and sulfuric acid in the atmosphere.

Emission scrubbers for opened-looped cycles are required and can remove the hydrogen sulfide. The wastewater generated from this process, and its disposal, is a source of potential impact on the natural habitat, including a number of effects.

Emergency geothermal fluid overflows containing brine and condensate may be stored in lined evaporation ponds at the power plant site. Waterfowl and shorebirds or other wildlife could seasonally inhabit or use these evaporation ponds for resting or foraging. The waste brine has high concentrations of heavy metals and minerals, which would be toxic to wildlife. At the time of upset, the heat of the brine is near the boiling point of water, which would kill any invertebrates or plants in the pond that could attract wildlife. Standard practices dictate that the brine be injected as soon as possible after upset, reducing the potential for impacts.

Hazardous Materials

Sulfur byproducts resulting from hydrogen sulfide removal procedures produce waste water sludge, or geothermal brine. The brine can have high concentrations of heavy metals (for example, arsenic, lead, copper, zinc, vanadium) and power plant equipment in contact may be considered hazardous materials.

These waste products and hazardous materials can contaminate surface and groundwater resources. Emergency brine ponds or evaporative ponds may be used to manage the wastewater but can damage the natural habitat. Preferable methods of mitigation include reinjection of the brine underground. (See above sections for more information.)

Visual and Noise

Cooling towers and the industrial aesthetics of facilities may be unappealing and can have a moderate sound level increase from operation. Facilities are typically located in remote areas, reducing visual or noise impacts.

Health/Safety and Public Services

Potential exposure to hydrogen sulfide or hot geothermal fluids and steam are the principal health and safety issues associated with geothermal plants. Accidental release of toxic emissions or fluid from the geothermal reservoir during drilling ("blowout") or injection is rare. The remote location of these plants limits public exposure and reduces safety concerns. The limited number of employees during operations would not impact housing, schools, police, emergency services, hospitals, and utilities.

Biomass

A small but growing percentage of power in California comes from biomass. Electrical power can be generated through burning or processing of biomass or its byproducts. Biomass resources that can be directly combusted or gasified (creating flammable gas from solids) include forest and wood products or waste, manufacturing waste, and municipal solid waste. Biomass must be collected and transported to the plant for processing and then prepared as feedstock, which can involve removing contaminants and chopping into chips.

Methane can be captured and burned from landfills or agricultural facilities with waste decomposition or anaerobic digestion, which can create biogas. Biomass can be used as the feedstock for alcohol fuels (for example, ethanol).

Biomass facilities are generally regarded as renewable resources if their feedstock is sustainably managed. However, these facilities can have a number of direct and indirect environmental impacts depending on the feedstock used. While waste as a feedstock can avoid emissions or landfill use, feedstock from forests, without sustainable management, can increase total CO_2 emissions. And although net emissions may be reduced, local air quality may be adversely affected. In addition, feedstock that is grown specifically for energy can require significant amounts of land and water, causing issues regarding feedstock availability.

Figure 7.8: Biomass Power Plant

Source: NREL

Air Quality

Combustion of biomass releases criteria pollutants, toxic air emissions, and odors that could significantly impact local air quality. Criteria air pollutants are defined as those air contaminants for which the state and/or federal government has established an ambient air quality standard to protect public health. Emissions may also result from vehicles transporting biomass materials and waste products to and from the plant. Relatively long distances may be required for transport, which can contribute a relatively high volume of air emissions.

Emissions from combustion can include significant levels of nitrogen oxides, particulate matter, and sulfur oxides. These may contribute to smog, nitrogen deposits, and respiratory effects. Waste incineration may release ammonia, chloride, organic compounds and heavy metals such as mercury and cadmium. In general, waste

feedstock, municipal wastes[4] that can be used to produce heat and power, is expected to emit more toxic air emissions than wood. Technology advances in scrubbing and incineration allow these emissions and toxins to be reduced if implemented properly.

Biomass plants also release CO_2. However, the cycle of growing, processing, and burning biomass recycles CO_2 from the atmosphere. If this cycle is sustained, there is little or no net gain in atmospheric CO_2. Given that short rotation woody crops (for example, fast-growing woody plant types) can be planted, matured, and harvested in shorter periods than natural growth forests, the managed production of biomass fuels may recycle CO_2 in one-third less time than natural processes.

Biomass power plants also divert wood waste from landfills, which reduces the production and atmospheric release of methane, a potent greenhouse gas.

Biomass Emissions

Emissions & Pollutants	Significant Impacts
NOx, PM_{10}, CO_2, VOC, CO, pesticides, fungicides	Smog, odors, nitrogen deposits, respiratory hazards, GHGs, local air quality

4 Municipal wastes as defined in the *Recommendations for a Bioenergy Plan for California* are diverted municipal solid waste (the organic fraction of municipal solid waste), urban wood waste, landfill gas, wastewater biogas, wastewater sludge, and waste oils, fats, and grease.

Water Use and Quality

Biomass facilities have water impacts similar to other thermal plants, with the exception of once-through cooling. Biomass facilities require water for steam turbines, cooling towers, and biomass process scrubbers. Once used, the water must be treated before reuse or discharge. Wastewater from emissions scrubbing can contain heavy metals and nitrates that can have adverse effects on the natural habitat. Improper handling of operational wastewater could also result in dispersion of contaminants to surface water. Liquid wastes require careful monitoring and treatment to avoid contamination to water supplies. Storage of feedstocks also has the potential to generate leachate that could contaminate groundwater.

If feedstock is grown specifically for energy harvesting, then the potential impact to the water supply used to grow the crop should be evaluated. Water demand for crops can be very high and would typically occur when water supplies are most in demand.

Land Use

Biomass power plants require approximately 1-2 acres per MW, depending on the technology. The feedstock, however, may require a much larger amount of land. Feedstock from natural or farmed forests can result in significant indirect land used for biomass facilities, while waste feedstock may not require additional land use (and may actually divert land fill use). There may also be significant land required for storing feedstock.

Tree farms grown specifically for energy harvesting may also require substantial amounts of land. Sustainable forest management practices can avoid topsoil erosion, depletion of nutrients, soil salinization, and fertilizer and pesticide runoff.

Biological Resources

The combustion of biomass can release air emissions and toxins that then contribute to smog and water contamination. These may be harmful to local species and plant life. Scrubbers can remove many of these, but nitrogen deposits may result from ammonia in the treatment of NOx that can harm sensitive species. Wastewater from emissions scrubbing and system cooling may contaminate soil and water (surface or groundwater) unless adequately treated to remove toxins and heavy metals as well.

Indirect biological resource impacts can arise from the use of wood feedstock from forests. Overforesting could cause species displacement and disturbance to the natural habitat. Using waste feedstock may avoid some biological resources impacts. Trucks delivering biomass feedstock to the facility can disturb sensitive species, release emissions, and increase accidental collisions with animals.

Transportation and Traffic

A high volume of trucks may be required to transport feedstock to the biomass power plant and the waste from the biomass plant to a disposal site. This can adversely affect on the local habitat and to the local community who may resist increased traffic and road maintenance costs. Residents can require developers to conduct traffic impact reports and incorporate measures to lower the increase in traffic.

Hazardous Materials

If municipal solid waste is used to generate electricity, acid gases can result and would require measures to reduce acidity. Similar to natural gas and geothermal facilities, biomass facilities use ammonia to reduce NOx emissions. The ammonia is considered hazardous and requires special controls. In addition, the burning of biomass in boilers creates ash that requires proper disposal. Ash can contain low levels of hazardous element, such as heavy metals. If municipal solid waste is processed to produce refuge derived fuel, hazardous waste and emissions, like heavy metals, can be generated on-site.

Visual and Noise

Cooling towers and the industrial aesthetics of facilities may be unappealing and can have a moderate sound level increase from operation. Frequent truck deliveries can increase noise.

Health/Safety and Public Services

Biomass operations involve the use of multiple chemical compounds that, if not handled responsibly, could impact the public. Calcium carbonate would be infected into the fluidized bed to control acid gases and sulfur dioxide (SO2). Lime would be injected into the scrubber to further control acid gases and SO2. Powdered activated carbon would be

injected prior to the baghouse to control mercury and dioxins. Ammonia would be brought to the site and stored as a liquid prior to infection into the boiler to help reduce NOx formation. Diesel emissions from truck traffic could also pose a risk to the public.

Nuisance odor impacts could arise from containment of materials (for example, biosolids) and from decomposition of biomass materials.

The workforce required for construction and operation of a biomass power plant is unlikely to adversely impact housing, schools, police, emergency services, hospitals, and utilities.

Solar Thermal and Solar Photovoltaic

Solar is the fastest growing renewable resource in California, and it is projected to be a key resource for meeting the state's renewable energy goals. There are varying types of solar technologies, but they mainly fall under solar thermal and solar photovoltaic (PV) systems. Solar thermal systems (including troughs, linear Fresnel, power towers) reflect the sun's heat and concentrate it to create steam that powers a turbine, while Stirling engines use the concentrated heat to expand a gas like hydrogen or helium to create mechanical motion to turn a generator. Solar PV systems directly convert sunlight into electricity.

Solar thermal and PV systems share many of the same environmental impacts but differ significantly in water use. Solar thermal plants require large amounts of water to run the turbine and cooling systems and to wash mirrors, whereas solar PV plants require water only for mirror washing. Both can require very large tracts of land for their components, often in undisturbed locations. The remoteness of these locations may also increase the need for additional transmission infrastructure and support services.

Figure 7.9: Solar Thermal Project in the Mojave Desert

Source: Recharge News

Air Quality

Due to the large amount of land that must be disturbed for solar facility installation, construction can generate significant amounts of fugitive dust. Exhaust emissions would also be caused by heavy, diesel-powered construction equipment, workers commuting to and from the work sites, trucks hauling equipment and supplies to the sites, and crew trucks (for example, derrick trucks, bucket trucks, pickups). Construction may continue for more than a year.

Operations cause low air quality impacts. Some solar facilities include cofiring of

natural gas, biomass, or biogas. Utility-scale solar installations may also have natural gas-fired power plants as back-ups to even out intermittency of output. When used, these systems would produce emissions associated with natural gas plants. Vehicle use associated with mirror washing would also create emissions.

Water Use and Quality

Water use in solar thermal system can have significant environmental impacts, especially since these projects are located in sunny and dry desert regions where water availability may be very limited. Solar thermal systems may require substantial amounts of water for steam, cooling, mirror washing, and other industrial processes, depending on the technology and cooling system required. Solar thermal plants may require up to 65 acre feet per year (AFY) of water per 100 MW, not including cooling water. Cooling water may require an additional 600-800 AFY per 100 MW. Dry-cooling can reduce the amount of water used, but at a cost of reduced generation. PV systems require minimal amounts of water for washing PV panels, approximately 2-10 AFY per 100 MW.

Solar thermal plants can have impacts comparable to other types of thermal power plants (See above sections for more information.), including depletion of groundwater and shared resources supplies, which can lead to water quality degradation and loss of potable water supply. Mitigation for impacts to water resources from solar thermal systems includes the use of dry-cooled systems. The majority of the solar thermal power plants currently under review by the Energy Commission include dry-cooled technology.

Construction activities can lead to adverse impacts to soils, including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water-dependent habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters. Because many of the solar projects are located in the desert and are near desert washes, water quality impacts can be a significant concern.

Land Use

Land use requirements for both solar PV and solar thermal systems are very high, requiring between 4 to 12 acres per MW. Larger plants are generally in remote and undisturbed locations, particularly in the California desert. Lands may fall under federal and state protection to avoid displacing natural habitats and species, or to preserve cultural and recreational resources. Additionally, many solar thermal and solar PV systems are located on land managed by the Bureau of Land Management, under the California Desert Conservation Area Plan of 1980, and would likely require a land use plan amendment. As noted earlier, remote locations also increase the need for additional transmission lines, which require significant land in their own right.

Biological Resources

Due to the large land footprint, a solar facility would likely cause loss of native plant communities, sensitive species, and loss of connectivity for terrestrial wildlife. Building a solar facility would potentially have an adverse effect on listed and sensitive wildlife species and their habitats either directly or through habitat modifications. Any wildlife residing within the solar project area would potentially be displaced, injured, or killed during project activities. An example of a wildlife species that could be impacted by the construction of a solar facility is the desert tortoise, a state and federally listed threatened species found in the Mojave Desert area of California. Relocating tortoises can be difficult. Some solar PV projects require minimal grading and use fencing that allows wildlife movement through the project. Construction and operation activities may result in direct or indirect impacts to the desert tortoise or its occupied habitat. While each individual project may mitigate the loss of desert tortoise habitat, when a number of developments occur in the desert, there may be significant indirect and cumulative impacts.

Additional concerns to biological resources include the introduction and dispersal of invasive or exotic weeds. The permanent and temporary earth disturbance adjacent to native habitats increases the potential for exotic, invasive plant species to establish and disperse into native plant communities, which leads to community and habitat degradation.

Hazardous Materials

While solar PV facilities generally do not require hazardous materials other than those required during construction, solar thermal facilities may have fluids considered hazardous. Examples of hazardous materials used in the operation of a solar thermal power plant include heat transfer fluids (such as Therminol VP-1) to create steam. Previous modeling of spills involving large quantities of more toxic materials has demonstrated that minimal airborne concentrations would occur at short distances from the spill. Liquid hazardous materials can be released during a transportation accident, and the extent of impact would depend on the location of the accident and the rate of vapor dispersion from the surface of the spilled pool.

Some solar thermal projects using Therminol VP-1 require gas-fired boilers to keep the heat transfer fluid in a liquid state. Natural gas pipelines and propane storage tanks can pose certain hazards. Stirling engines can require storage of large quantities of hydrogen gas.

Adherence to a safety management plan can avoid the likelihood of releases of hazardous materials.

Visual and Noise

Solar projects can cause dramatic changes to the existing landscape, particularly as seen from areas valued for their unique scenic value (for example, within the Mojave National Preserve); designated scenic vistas; or rural residential areas. With the addition of solar projects, views of the desert and

rural communities would change from a relatively undisturbed desert landscape to a substantially more industrial, highly altered one, dominated by multiple square miles of mirror arrays. Depending on the solar technology, solar collector towers up to 600 feet or more, as well as light rays reflected off ambient atmospheric dust and the bright glow of the receiving portions of the solar collectors could create significant visual change. Glare can also be a significant issue if solar panels or mirrors are visible to cars or airplanes. The visual impacts of solar facilities are highly site-specific and would depend on characteristics, such as topography, proximity to urbanized areas, and the existing character of the land.

Solar facilities do not generate significant noise, with the exception of Stirling engines, which have higher noise levels from the generator, cooling fan and air compressor used on each of the components comprising the facility.

Safety/Health and Public Services

Solar facilities may cause health concerns if large quantities of dust are generated in areas where valley fever occurs. Valley fever is primarily encountered in southwestern states, particularly in Arizona and California. It is caused by inhaling the spores of the fungus Coccidioides immitis, which are released from the soil during soil disturbance (for example, during construction activities) or wind erosion. The disease usually affects the lungs and can have potentially severe consequences, especially in at-risk individuals. Trenching, excavation, and construction workers are often the most exposed population.

Other safety and health concerns are addressed in previous discussions of heat transfer fluids and glint and glare.

Solar facilities occupy large segments of land (thousands of acres) in generally remote areas. The presence of multiple facilities can strain public services, especially fire protection. Fire districts may not have stations located near solar facilities or may not have adequate personnel to respond to multiple incidents.

Wind

Wind is a growing renewable resource in California and provides roughly 2.5 percent of electricity to the State. California was the first state in the country to develop large wind farms but now lags behind other states, such as Texas, as a leader in wind power. Although technology advances have made turbines more efficient, large tracks of land are still required. Bird and bat collisions, though location-specific, have been a major concern.

Figure 7.10: Altamont Pass Wind Farm

Source: Aspen Environmental Group

Air Quality

The operation of wind facilities does not generate air emissions, other than from mobile source activity for maintenance. Construction of the facilities, typically lasting about a year, can generate fugitive dust and particulates.

Water Use and Quality

Water supplies are unlikely to be affected from wind development. However, erosion concerns tend to be high for wind farms, due to the practice of siting wind turbines on slopes and ridges where the wind is the strongest and most accessible. This has been an issue in the dry, desert terrain of the Tehachapi region of Southern California, where service roads and tower foundations have created gullies and other land forms resulting from soil erosion. Accelerated wind and water-induced erosion may result from earthmoving activities during construction, causing onsite soil loss and increased sedimentation off site.

Land Use

Wind farms require significant amounts of land (approximately 5.5 acres per MW), although the turbines themselves may occupy only 3 to 5 percent of the land. Wind farms have the potential to conflict with general plans or with the overall character of the surrounding area, disrupt established communities, or physically intrude upon the landscape. The small turbine footprint, however, can allow some activities, such as farming, to continue while impacting others, such as recreation. Many wind facilities are sited on ridge tops of undeveloped land that may be under the jurisdiction of the U.S. Forest Service or the Bureau of Land Management. Should a wind project be sited on federal land, it must be found compatible with the land use plans for these regions.

Biological Resources

Construction and development of wind farms can lead to temporary or permanent effects to natural vegetation and wildlife habitat. Construction of wind projects would include grading for wind turbine pads, access roads, right-of-way for interconnection systems, and possible maintenance facilities, and meteorological tower pads. All of these construction activities would result in temporary and/or permanent losses of native vegetation. Impacts to sensitive wildlife species could also occur either directly or through loss of habitat.

Bird and bat deaths associated with wind turbines are the most publicized biological resource concern. Although bird mortality has occurred in the past at the Altamont Pass wind area, studies have shown that bird collisions are not a critical problem at most other wind development areas or in areas where new turbine designs have been used. The Energy Commission published the *California Guidelines for Reducing Impacts to Birds and Bats From Wind Energy Development* in 2007, which provide information to help reduce impacts to birds and bats from new wind development or repowering of existing wind projects in California.

Hazardous Materials

Turbines that are not well-designed or maintained can cause fluid leaks at the turbine, both dripping directly downward or flying off the tips of the blades. Ground contamination could result. If using hazardous materials, a hazardous materials management plan should be developed to address avoidance, handling, disposal, and cleanup of any spills.

Additionally, wind turbines can be a source of wildfire ignitions due to power collection line failure, turbine malfunction or mechanical failure, and lighting- and bird-related incidents. When mechanical or electrical failures cause turbines to catch fire, they may burn for many hours if located in a rural, ridgetop setting since fire suppression crews would have limited ability to effectively fight fires hundreds of feet above the ground. Wind-blown flaming debris from a turbine fire can ignite vegetation in the surrounding area.

Visual and Noise

Wind projects affect visual resources due to the height of towers and rotating blades that occur aloft, where the wind resource is most accessible. Wind turbines arrayed along ridgelines to capture wind flows over the ridges are visible over greater distances than those on flat or rolling terrain. Visual impacts would depend on the surrounding terrain and the spacing, design, and uniformity of the turbines, markings or lighting, roads built on slopes, and service buildings.

The fewer and wider-spaced turbines associated with new wind farms may present a more pleasing appearance in contrast to the more tightly spaced turbines associated with older wind farms.

Shadow flicker may be associated with wind farms. As the blades rotate, shadows pass over the same point causing an effect termed *shadow flicker*. Shadow flicker may become a problem when homes are located nearby or have a specific orientation to the wind farm. Most problems occur generally southwest and southeast of the turbines.

Similar to shadow flicker, blade or tower glint occurs when the sun strikes a rotor blade or the tower at a particular orientation. This can impact a community, as the reflection of sunlight off the rotor blade may be angled toward nearby residences. Blade glint is a temporary phenomenon for new turbines only and typically disappears when blades have been soiled after a few months of operation.

Most modern wind turbines are of heights that bring them into airspace regulated by Federal Aviation Administration (FAA). FAA regulations require aircraft warning lights installed on all towers taller than 200 feet. Turbines on wind energy farms generally stand between 300 to 400 feet high. Lighting and possibly marking are likely to be required on some portion of the structures. More lights and markings may be required for wind farms sited near airports. On large wind farms, illuminating every turbine could add light pollution to remote areas.

Noise associated with a wind facility stems from equipment used during construction and the massive rotating elements of the turbine in operation. Principal sources include truck traffic, blasting associated with foundation construction, and operation of heavy equipment. Noise from construction would have limited and short-lived impacts to local populations. Wind farms are typically located in rural or remote areas, with low ambient noise levels. Residential land uses near wind power plants may be affected by the noise of turbines and generators in operation, and biological resources would tend to be affected by noise levels that could disrupt critical life-cycle activities (for example, mating, nesting) of animal species of concern.

Noise levels associated with new wind farm operations are lower than the earlier-generation of wind power plants. Modern towers are streamlined and insulated to avoid sound. Wind turbines make aerodynamic noises caused by the flowing of air through the blades of a wind turbine, and mechanical noise from generators Generally speaking, the higher the speed of the wind, the louder the noise will be, although the noise may be masked by the sound of the wind itself. The topography of the surrounding landscape can affect noise distribution. Hilly terrain, often common at wind farm sites, can be more effective at shielding wind turbine noise than flat terrain.

Safety/Health and Public Services

There are no significant safety and health or public services issues associated with wind farms.

Small Hydro

Hydroelectricity provides a significant source of electricity in California with nearly 400 hydro plants contributing 15 percent of the state's total power. Hydro plants use the energy from moving water (from height and pressure differences) to spin turbines and create electricity. Large hydro plants (above 30 MW) are not currently being built, due to their environmental impacts, including modified stream flows and fish mortality. Small hydro plants (below 30 MW) have fewer impacts compared to large plants; the remaining discussion focuses on small hydro.

Types of Hydro Facilities

Run-of-river	Uses natural flow of river to spin turbines
Dam - Reservoir	Dam is used to create height differential and increase in power output. Reservoirs can be created for energy and water storage
Pumped Storage	Pumps water back into reservoir during off-peak for later use during peak hours. Less efficient, but can be more economical

Air Quality

There are few air quality impacts associated with small hydro plants.

Water Use and Quality

In general, the larger the hydro facility size and power capacity, the greater the impacts on water use and quality. Hydro facilities with dams or reservoirs can completely divert the water from a stream or change the ecosystem up and down stream. Run-of-river facilities may help in reducing the diversion of stream flows but may still block migration paths of fish and increase temperature, which can decrease the availability of oxygen in the water for aquatic species. The presence of dams may decrease turbidity, the sediment in water, altering the natural ecosystem. New small hydro facilities reduce the impact on in-stream beneficial uses or the volume or timing of stream flow. For example, relicensing a hydro facility may require less stream volume diversion, which would allow healthier stream flows but would result in reduced power output.

In California, water supplies and hydro facilities are heavily dependent on rainfall. New facilities may also increase demand on water resources for agriculture and drinking water, especially in dry years.

Land Use

Land use requirements are generally low for small hydro facilities, unless dams and reservoirs are used. Dams inundate land, though the reservoirs can still be used for recreation. Many small hydro power facilities involve construction and installation of turbines in waterways. Land is also required for plant operating buildings and maintenance roads. Facilities that provide public drinking water may require additional land to protect the watershed.

Biological Resources

The presence of hydro facilities, depending on the size, can have significant adverse impacts on local ecosystems. Hydro facilities may divert water flow through a stream and in some cases completely inhibit water flow. Upstream impacts can include inundation of plants, especially with dams and reservoirs. Downstream effects include loss of sediment, which can lead to loss of river banks, turbulent water flows, and increased temperature.

These impacts can significantly affect aquatic life such as fish. Migratory paths for spawning may be completely blocked, or fish can be directly killed when traveling through turbines. Fish that survive through turbines can become disoriented and more susceptible to predators while exiting. The increase in downstream water temperature also decreases the amount of oxygen available for fish and can affect aquatic fauna populations.

Fish ladders and escalators are a potential solution to allow fish to travel up and down stream and are required for many facilities to relicense.

Hazardous Materials

There are no hazardous materials associated with small hydro facilities other than those used during construction.

Visual and Noise

Small hydro plants generally appear less visually disturbing when compared to the more massive large hydro facilities that alter the natural scenery. There may be increased noise from water flow through small hydro facilities, but generally it is not a problem as these facilities are usually located in remote locations.

Safety/Health and Public Services

There are no significant safety and health or public services issues associated with small hydro plants.

Ocean

Although ocean energy is not a widely used resource, it may potentially become an important renewable resource in California given its coastline advantage. Among the more potentially viable ocean energy technologies are wave and tidal power and ocean wind. Other technologies exist but are much farther from commercialization.

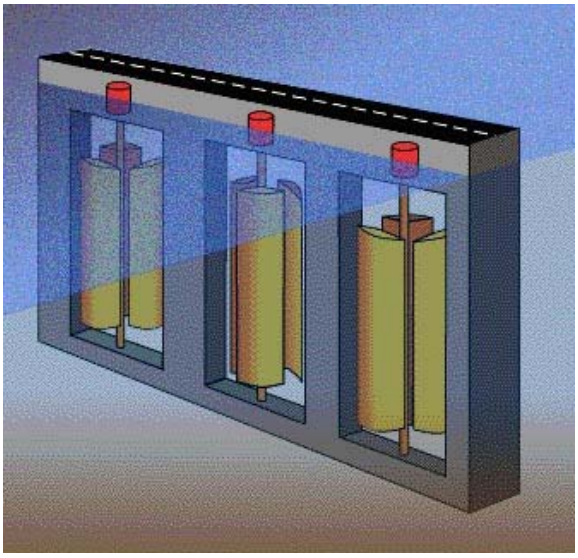
Tidal power converts the energy from tides into usable electricity. The gravitational pull of the sun and moon create predictable changes in elevation and tides, allowing water movement to power turbines, much like hydro power. Forms of tidal power have been used since the Middle Ages. Distinct from tidal, wave power converts the surface motion of waves into electricity. The first commercial wave power facility was developed in Portugal in 2008. PG&E has applied to the California State Lands Commission and FERC for a lease/license to install a wave energy demonstration facility off Humboldt County.

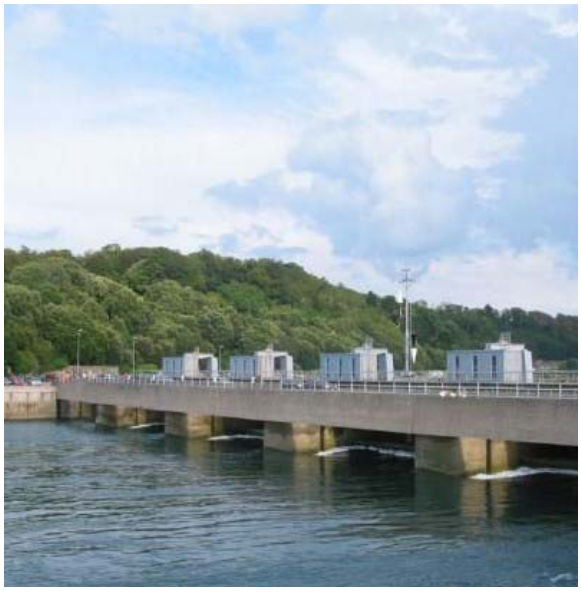
Tidal power facilities share many similar environmental impacts with hydroelectric facilities. They often require blockage of flow with barrages (similar to dams), tidal fences, and turbines. This can alter the migration patterns of aquatic life, change the salinity of water, and alter the natural ecosystem. Environmental effects of wave power facilities have not yet fully been studied. However, a study published by the U.S. Department of Commerce and National Oceanic and Atmospheric Administration, *Ecological Effects of Wave Energy in the Pacific Northwest*, identifies a number of potentially significant environmental impacts created by wave power. Impact thresholds need to be established. As projects scale up in location or implementation, new risks may become evident.

The first ocean wind farm (Cape Wind) in the United States, in Nantucket Sound, was approved in April 2010. Major U.S. projects are on the drawing board for the waters off New Jersey, Delaware, and Texas. The lead federal agency reviewing the project, the Minerals Management Service, determined that the Cape Wind project poses no major environmental problems.

Ocean wind farms can either be fixed or on floating platforms. Europe leads the world in offshore turbines, which are currently mounted on fixed-bottom, foundation-based towers in water less than 130 feet deep. However, the world's first deep-water, floating turbine, capable of generating 2.3 megawatts of electricity, is currently being tested off the coast of Norway.

Figure 7.11: Tidal Fence (top) and La Rance Tidal Barrage in France (bottom)





Source: University of Pennsylvania

Air Quality

Tidal, wave, and wind power facilities do not have significant impacts on air quality.

Water Use and Quality

Tidal power facilities can have adverse effects on large volumes of water. Rivers and streams often bring sediment to the ocean, but a large physical obstruction can alter the amount of suspended matter in the water, decreasing the turbidity. The accumulation of sediment around the generating structure (barrage) can erode the surrounding land and decrease the level of silt that can infiltrate out of the basin.

Other impacts include decreasing salinity in the water basin as a result of the restricted water exchange and an increase in water temperature. This can occur when water travels through the turbines.

Land Use

Land use may be considered low as the primary footprint of ocean energy facilities is over water. However, recreation and commerce activities may still be altered with the presence of large offshore power facilities. Land-based support facilities, access, and transmission may also increase the property requirements and community impacts.

Biological Resources

Depending on the type of ocean energy facility, a number of biological impacts can occur. Tidal fences can block channels, altering migration patterns of fish and mammals. These can be engineered to allow fish to travel through safely, though larger animals may need sonar sensors for detection and auto-shutdown.

Tidal barrages can be similar to dams and may block off channel or estuarine mouths. Barrages can have more significant impacts than fences because they can block migration and alter the hydrology.

The turbidity (amount of suspended matter in the water) may be decreased, allowing

sunlight to penetrate the water. This can propagate up the food chain by increasing the food available for phytoplankton and its population. The restriction of water exchange can also alter the salinity in the water basin. The tidal barrage facility at La Rance, off the Brittany coast of northern France, has had detrimental effects to flora and fauna populations from a combination of these impacts.

In both tidal fences and barrages, turbines can be fatal to fish populations. Lower speeds and greater distances between turbines can help mitigate this, along with allowing more silt and sediment to pass though. The temperature of water may also be increased from turbines, which can limit the amount of oxygen available in the water.

Wave and wind energy development may affect community structures for fish and fisheries. Lighting and above-water structures may result in marine bird attraction and collisions and may alter food webs and beach processes. Electromagnetic effects may affect feeding or orientation and should be better understood. The use of buoys may have positive effects on forage fish species, which in turn could attract larger predators. Structures need to reduce potential entanglement of larger predators, especially marine turtle species. However, structures may also serve as artificial reefs. Turbine noise may travel underwater, similar to marine engines, and disturb sea life.

Hazardous Materials

There are no hazardous materials associated with ocean energy facilities.

Visual and Noise

Ocean energy facilities may be very large and appear to have a massive industrial aesthetic, even though much of the facility can be under water. The disruption of the natural ocean view may be received negatively.

Impacts on fish and marine mammals caused by noise coming from the buoys should be understood and mitigated.

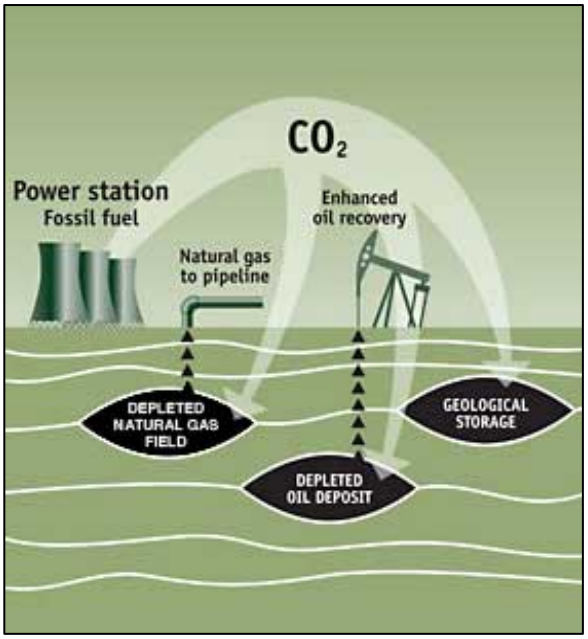
Health/Safety and Public Services

With the exception of possible collisions with oceangoing ships and boats, there are no health and safety or public services impacts from ocean energy facilities.

Carbon Capture and Storage

The majority of electricity used in California comes from fossil fuels. Carbon capture and storage is designed to capture CO_2 released from fossil fuel power plants and store the gas permanently in forests, underground or in the deep ocean. It is a technology in the demonstration phase with various methods of extracting CO_2 from the flue gas of power plants. Costs of extraction, transportation, and storage of CO_2 are significant uncertainties, along with the viability of keeping CO_2 sequestered essentially forever. There are a number of risks and environmental impacts associated with CO_2 that mainly revolve around the possibility of leakage.

Figure 7.12: Carbon Capture and Storage (CCS)



Source: California Energy Commission

The Energy Commission, the CPUC, and ARB formed a California Carbon Capture and Storage Review Panel in 2010 to review carbon capture and storage (CCS) policy and develop recommendations that could help guide legislation and regulations regarding CCS in California. CCS has been identified as a potential strategy for reducing GHG emissions from major industrial sites.

Figure 7.13: Sleipner CCS Plant in Norway

Source: Statoil

Air quality impacts stem from leaks from CCS facilities. These can occur from pipelines or the storage of CO_2. Large volume leaks could contribute to sudden increases in atmospheric CO_2 and contribute to climate change. High concentrations of CO_2 could also cause plant and animal mortality.

Water Use and Quality

Impacts on water quality may be affected from possible leaks that would elevate CO_2 concentrations in the shallow subsurface. This can contaminate groundwater but would also be lethal to plants and subsoil animals. Leaks in the geological storage may lead to increased acidity, leaching chemicals, such as lead, from rocks into surrounding underground water.

Process water from fossil fuel and CCS facilities may contain nitrates, specifically, NO_3, and other chemicals, such as mercury, selenium, cyanide, and arsenic. Equipment and wastewater may potentially contaminate water sources.

Land Use

CCS facilities generally coexist with other types of energy facilities and could potentially share some of the facility footprint. However, substantial amounts of land would be required for a network of new pipelines dedicated to CO_2 transport and for vast volumes of permanent storage underground (if using geological sequestration). Use of the lands above the underground storage would be limited.

Proposed storage locations must be near geologic formations, such as saline aquifers

off and on shore, depleted oil and gas reservoirs, enhanced oil recovery, or coal beds. These storage sites would require impermeable cap rocks, geologic stability, and an absence of leak paths. There is a potential for stored CO_2 to adversely affect underground metal components, such as well liners.

Biological Resources

Biological resource impacts would come from potential leaks of CO_2. Leaks in underground storage sites can contaminate water sources and can be fatal to subsurface soil life, plants and animals. Ocean sequestration can lead to a number of adverse effects on the aquatic life. Ocean acidification has been shown to occur with the increase of CO_2 in the concentration of seawater. In particular, this can be fatal to coral and other ocean organisms. Adding industrial scale amounts of liquid CO_2 to the ocean floor is likely to alter the local chemical environment of seawater. There is little information about the long-term effects of ocean sequestration.

Hazardous Materials

Certain types of carbon capture technology require chemicals to remove CO_2 from the flue gas. In particular, amine solvents are used in water to dissolve CO_2 into the water. The process requires reheating to remove pure CO_2 from the stream, but the remaining solution may contain sulfur, nitrogen oxides, and dust. To save money, it may be feasible to have less pure CO_2 streams injected underground, in which case, some of these toxins may be introduced into storage sites.

Visual and Noise

CCS facilities are associated with thermal plants and are unlikely to add noticeable visual and noise resource problems.

Safety

CCS facility safety concerns mainly revolve around the permanent timeline of CO_2 storage, potentially millions of years. Large volumes of CO_2 injected underground must be monitored indefinitely, and risk management is critical. The built-up pressure of large volumes of CO_2 can induce small seismic events. Also, there are a number of mechanisms that can cause a release, including injection well failure, abrupt leakage, or gradual leakage from undetected faults, fractures, and wells.

Most countries have few specific regulations or frameworks for long-term storage, leakage liability, and monitoring. However, there may be relevant regulations and laws with regard to fossil fuel drilling and extraction. For example, Class II injection wells are regulated by the Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR), under provisions of the state Public Resources Code and the federal Safe Drinking Water Act. Class II injection wells are used to safely dispose of the salt and fresh water produced with oil and gas. Injection is often accomplished in a manner that will increase oil and gas production. However, DOGGR has expressed concern about potential adverse impacts to remaining oil deposits.

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